



2017 L.G. Hanscom Field

Environmental Status & Planning Report



Massachusetts Port Authority
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May 15, 2019

Secretary Kathleen Theoharides
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Alex Strycky, EEA No. 5484/8696
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: 2017 L.G. Hanscom Field Environmental Status & Planning Report (ESPR) (EEA # 5484/8696)

Dear Secretary Theoharides and Director Buckley:

The Massachusetts Port Authority (Massport) is pleased to submit for your review this *2017 L.G. Hanscom Field Environmental Status and Planning Report (2017 ESPR)* (EEA #5484/8696). The *2017 ESPR* is being submitted in accordance with the provisions of the Massachusetts Environmental Policy Act (MEPA), G.L. Chapter 30, Sections 62-62H and its implementing regulations, 301 Code of Massachusetts Regulations (CMR) 11.00. The *2017 ESPR* responds to the November 16, 2017 Certificate on the Proposed Scope for the *2017 ESPR*.

This ESPR provides updated forecasts looking at potential future scenarios for 2025 and 2035. The analyses also incorporate use of the Federal Aviation Administration's (FAA) newest aviation noise and air quality model. The Aviation Environmental Design Tool (AEDT) has replaced the legacy Integrated Noise Model (INM) and the Emissions and Dispersion Modeling System (EDMS). Chapters 7 and 8 describe the new model and present the detailed noise and emissions findings. This is also the first Hanscom ESPR that presents an estimate of current and future greenhouse gas (GHG) emissions.

As we have done in the past, Massport is requesting an extension of the public comment period to approximately 50 days with the close of public comments on July 11, 2019. The MEPA consultation session is scheduled for June 11, 2019 at 6:30PM in the Civil Air Terminal at Hanscom Field. Two additional technical meetings are scheduled for 6:00PM on June 4 and June 6 in the Civil Air Terminal at Hanscom Field.

Members of Massport staff and the consultant team are available to discuss the attached document with you at your earliest convenience. Please contact me at (617) 568-3524 or sdalzell@massport.com with any questions or comments.

Sincerely,

Massachusetts Port Authority

Stewart Dalzell, Deputy Director
Environmental Planning and Permitting

Cc: S. Williams, A. Goodspeed, A. Gallagher, M. Gove/Massport
K. Preston/HMMH

Enclosures

2017 L.G. Hanscom Field Environmental Status & Planning Report

Bedford, Massachusetts

EEA Number: 5484/8696

May 2019



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1

Executive Summary



Laurence G. Hanscom Field (Hanscom Field) is the Massachusetts Port Authority's (Massport) premier general aviation airport in the region and a reliever airport to Boston Logan International Airport. Hanscom Field is approximately 20 miles northwest of Boston, located within the municipalities of Lincoln, Concord, Lexington, and Bedford.

Massport has regularly reviewed and analyzed the environmental impacts associated with the operation of Hanscom Field, potential future development based on demand, and the anticipated cumulative effects of those projects. Massport prepared Generic Environmental Impact Reports (GEIR) from 1985 to 1995, and Environmental Status & Planning Reports (ESPR) approximately every five years since 2000.

This introduction to the 2017 ESPR provides background information on Hanscom Field, describes the environmental review process, identifies the analytical framework for the ESPR, summarizes the primary changes since the 2012 ESPR, and provides the organization for the report. A summary of the key findings from each chapter is presented in the sections below: Facilities and Infrastructure, Activity Levels, Airport Planning, Regional Transportation Context, Ground Transportation, Noise, Air Quality, Cultural and Historical Resources, and Sustainability and Environmental Management.

1.1 Environmental Status & Planning Report

The Massachusetts Port Authority (Massport) has filed this Environmental Status & Planning Report (ESPR) for calendar year 2017, in compliance with Massachusetts Environmental Policy Act (MEPA), to provide a status report on activity levels and environmental conditions at Laurence G. Hanscom Field (Hanscom). The Secretary of the Executive Office of Energy and Environmental Affairs (EEA) defined the scope for the *2017 ESPR* in a Certificate issued November 16, 2017.

This ESPR reports on current conditions at Hanscom Field and compares them to historical data from the *2000*, *2005* and *2012 ESPRs* and other available sources as described in each chapter. The *2017 ESPR* informs future planning by presenting and evaluating the potential cumulative environmental effects of future scenarios for the planning years 2025 and 2035 based on forecasts of airport activity levels. The 2025 and 2035 scenarios represent estimates of what *could* occur (not what *will* occur) in the future using certain planning assumptions, but are not necessarily recommended outcomes. The future scenarios are consistent with Massport's 1978 Master Plan and 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

The retrospective and prospective information presented in this ESPR provide a planning tool for assessing and reviewing changes at Hanscom Field and its environs over time. The aviation activity forecasts in the *2017 ESPR* account for a realistic level of aviation growth based on local and national aviation trends and forecasts. Additionally, the *2017 ESPR* serves as a reference for regional planning activities for the Towns of Bedford, Concord, Lexington, and Lincoln, as well as State agencies and other interested parties. For reference, Figure 1-1 shows the location of Hanscom on the U.S. Geological Survey (USGS) map.

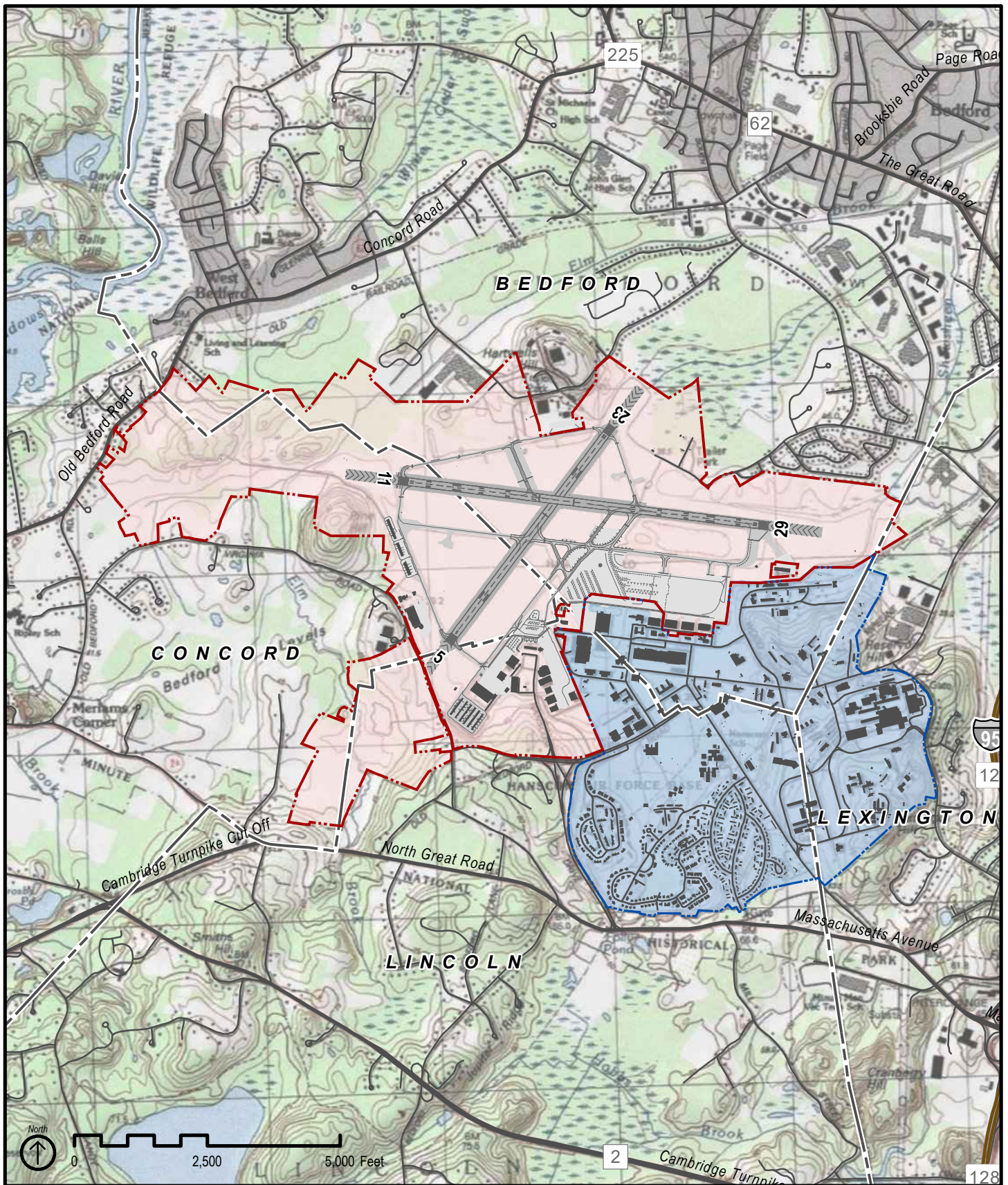
EEA #5484/8696

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- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary



L. G. Hanscom Field

2017 Environmental Status & Planning Report

Locus Map

1.2 Hanscom Field Overview

Hanscom Field is New England's premier, full-service general aviation (GA) airport and serves as a GA reliever for Boston Logan International Airport. It is located approximately 20 miles northwest of Boston, comprising approximately 1,300 acres of land, in close proximity to Minute Man National Historical Park (MMNHP) and Great Meadows National Wildlife Refuge (GMNWR). Hanscom lies just outside Route 128/I-95, and is convenient to most of metropolitan Boston. Route 2A serves as a primary commuter route and it is also the primary access route to the airport, Hanscom Air Force Base (AFB), and MMNHP. Figure 1-3 provides the site location of Hanscom Field in relation to these roads and its boundaries with MMNHP, GMNWR, and Hanscom AFB.

Hanscom Field is located within parts of four different municipalities: Bedford, Concord, Lexington, and Lincoln. To the south, it abuts the MMNHP, which comprises over 900 acres. The 800-acre Hanscom AFB also adjoins Hanscom to the south. GMNWR, which includes 3,600 acres along the Concord and Sudbury Rivers, is located to the west of Hanscom Field. These large land holdings provide a buffer between Hanscom Field and residential areas. Despite its proximity to public recreational areas and adjacent communities, the airport is visible from few locations due to its location within a low-lying, flat area in the landscape.

Hanscom Field Fast Facts:

- ⇒ Hanscom Field was constructed in 1941 and has been owned and operated by Massport since 1974.
- ⇒ It is a general aviation reliever airport for Boston Logan, with approximately 129,000 operations in 2017.
- ⇒ Hanscom Field is located in parts of four municipalities: Bedford, Concord, Lexington, and Lincoln.
- ⇒ Two national parks are in the vicinity: Minute Man National Historical Park and Great Meadows National Wildlife Refuge.

The FAA identifies Hanscom Field as a reliever airport. As such, its primary role in the regional aviation system is to accommodate regional GA needs, while providing supplemental service to meet small-scale, niche demands. This allows larger nearby airports to concentrate on large-scale commercial and cargo activity.

Massport assumed ownership of Hanscom Field in 1974 and prepared a Master Plan for the airport in 1978, which included a comprehensive public outreach process. In 1980, after additional stakeholder engagement, Massport adopted the Hanscom Field Noise Rules (740 CMR 25.00), which were an important outgrowth of the Master Plan. The Master Plan and the 1980 Noise Rules remain the framework for airport planning and operations today.

The variety of aviation activities at Hanscom Field include private and corporate aviation, recreational flights, pilot training, air charter, cargo, and limited military use. The Master Plan and 1980 Noise Rules contemplated and provided for scheduled commercial airline service specifically allowing for scheduled commercial passenger aircraft with 60 seats or fewer.

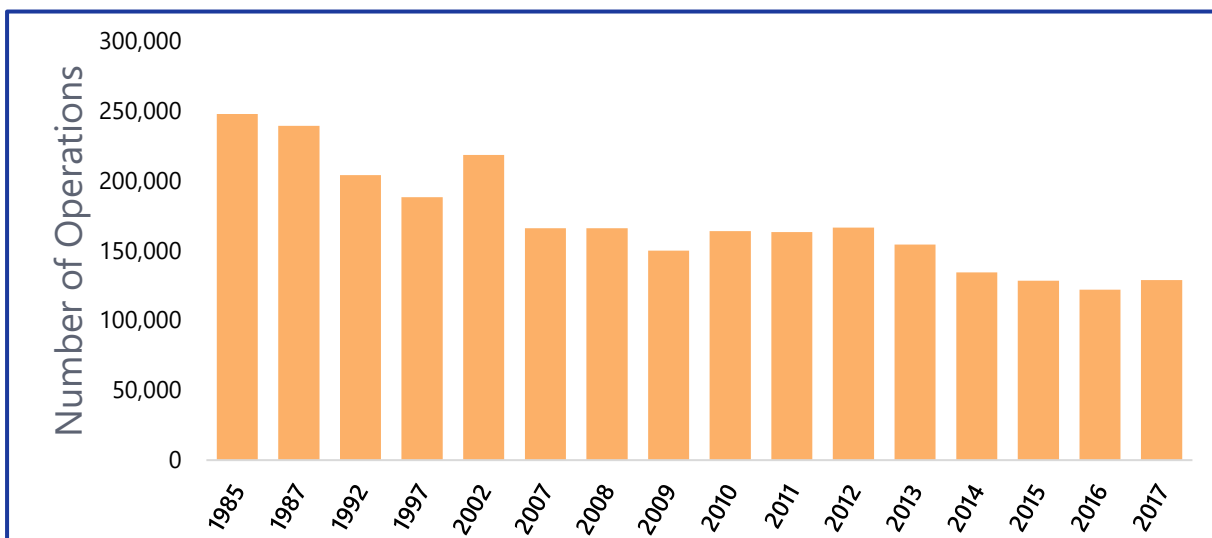
Commercial airlines have operated periodically at Hanscom Field since the mid-1970s. Pan Am was the most recent airline to provide scheduled commercial passenger services and Streamline Air provided scheduled charter service until September 2012. There have been no scheduled commercial passenger operations since 2012.

In 1970, four years before Massport assumed operation of Hanscom Field, airport activity peaked at slightly more than 300,000 total annual aircraft operations. By 2000, operations at Hanscom Field had decreased to 212,400, with GA representing 96 percent of total activity, scheduled commercial passenger service accounting for three percent, and military at less than one percent.

Hanscom's total aircraft operations have declined by about 5 percent each year since 2012, down from approximately 166,000 operations in 2012 to approximately 129,000 operations in 2017. This is well below the operations in 1985, which were close to 250,000 when Massport developed the first GEIR. GA now accounts for 99 percent of all operations.

Despite these trends, Hanscom Field continues to play an important role as a regional transportation asset that is linked to the economic health of the region. This is reflected in the expanding market for corporate aviation. Business jet operations at Hanscom have increased at a compound annual rate of 2.6 percent from 2012 to 2017.

Figure 1-2 Operations at Hanscom Field 1985-2017



Source: Massport EXP NOMS System, Annual Noise Report for Hanscom Field; Operations between 7:00AM-11:00PM, the hours that the air traffic control tower (ATCT) is open

1.2.1 Economic Impact of Massachusetts Airports

The aviation industry and airports, including Hanscom Field, comprise a significant element of Massachusetts' economy. The FAA and the Massachusetts Department of Transportation (MassDOT) continue to invest in airport infrastructure to improve and enhance economic development opportunities. MassDOT published the *Massachusetts Statewide Airport Economic*

Economic benefits of Hanscom Field to Massachusetts:

- ⇒ 2,243 jobs supported by Hanscom Field.
- ⇒ \$680 million in economic activity.

Impact Study in 2011, which was updated in 2019, summarizing the economic benefits that Massachusetts derives from its public-use airports. The study describes how the local economy builds on aviation and enumerates the other benefits that air transportation provides to its host communities.

The study found that Massachusetts public use airports generate \$24.7 billion in total economic activity, including \$7.2 billion in total annual payroll resulting from

199,237 jobs that can be traced to the aviation industry. In particular, Massport's three airports (Boston Logan International Airport, Hanscom Field and Worcester Regional Airport) have made significant contributions to the regional economy, generating approximately \$23.1 billion (94 percent) of the overall annual economic benefits generated by the Massachusetts airport system. Hanscom Field is particularly important for its function as the airfield for Hanscom AFB, an

active military facility, which is aided by its proximity to the Boston-area technology and research industries. Hanscom Field alone supports 2,243 jobs and generates \$680 million in economic activity, but combined with Hanscom AFB, the two entities together support 19,587 jobs and have a total economic impact of \$6.7 billion. For every \$100 spent by aviation-related businesses, an additional multiplier impact of \$56 is created within Massachusetts, according to the study.¹ While the economic impact of the region's airports was the focus of the study, it also noted qualitative benefits of the state's airports.

Qualitative benefits of the state's airports include:

- ⇒ Facilitating emergency medical transport;
- ⇒ Providing police support;
- ⇒ Supporting aerial surveying, photography and inspection operations;
- ⇒ Supporting U.S. military and other government operations; and
- ⇒ Providing youth outreach activities.

¹ Massachusetts Statewide Airport Economic Impact Study Update, January 2019, Massachusetts Department of Transportation. Available at https://www.mass.gov/files/documents/2019/03/25/AeroEcon_ImpactStudy_January2019.pdf

1.3 Hanscom Field Environmental Review Process

Since 1985, the Massachusetts Secretary of the Executive Office of Energy and Environmental Affairs (EEA) has requested that Massport prepare a report every five years, in order to evaluate the cumulative effect of growth and change at Hanscom Field and provide data and analyses on noise, ground transportation, air quality, and water quality. The original *1985 GEIR* (Generic Environmental Impact Report), the *1995 GEIR Update*, the *2000 ESPR*, the *2005 ESPR*, the *2012 ESPR*, and now the *2017 ESPR* provide a retrospective analysis of the environmental effects of Hanscom Field while including analyses for potential future conditions. The role of the ESPR and relationship to project-specific environmental review is described below.

1.3.1 Role of the ESPR as an Airport-wide Review

Environmental review of Hanscom Field activities is undertaken at the state level through the ESPR process, which provides a public forum to assess the cumulative environmental effects of airport operations and informs Massport and the community regarding the implications of those environmental effects. The ESPR presents an overview of the operational environment and planning status of Hanscom Field, and long-range projections of environmental conditions, against which the effects of future individual projects can be compared. It allows the reader to see past and current environmental information, and a forecast of potential future environmental effects at Hanscom Field based on realistic changes in activity levels.

Massport has developed the *2017 ESPR* primarily for review under MEPA. However, the document is utilized in a broader context. For example, potential future development documented within the ESPR (see Chapter 4 Airport Planning) may be subject to further environmental review under the National Environmental Policy Act (NEPA) prior to a project being implemented.

Massport collaborated with the FAA during the preparation of this ESPR regarding future plans for the airport and the forecast of aviation demand, and Massport is committed to working with the FAA on an ongoing basis to conduct the necessary environmental reviews under NEPA and other applicable special purpose laws such as the Endangered Species Act. As the FAA reviews future development, it will determine what specific analysis is required depending on the nature and anticipated impacts of the potential future projects.

The ESPR is also an important tool in early public engagement for future development activities. It provides a list and description of capital projects that may be undertaken or supported by Massport within the timeframes of the 2025 and 2035 scenarios. Additionally, the ESPRs are a comprehensive source of technical data and planning information for use by the towns of Bedford, Concord, Lexington, and Lincoln, State agencies and other interested parties. The ESPR does not replace the requirement for filing an Environmental Notification Form (ENF) for a specific project that meets or exceeds a NEPA or MEPA regulation threshold.

1.3.2 Project-Specific Review

While the ESPRs are an important part of the regulatory process, environmental review must also be undertaken on a project-specific basis.

In cases where the state environmental review thresholds are triggered, Massport or the project proponent will prepare the appropriate environmental filing, including an ENF or, for projects of significant scale requiring more extensive MEPA review, an Environmental Impact Report (EIR). Where NEPA environmental review thresholds are triggered at the federal level, projects typically are also reviewed under the NEPA environmental review process with the FAA acting as the lead federal agency responsible for NEPA compliance. Both MEPA and NEPA review processes include opportunities for public comment. For example, the recent Hanscom Field Aviation Facility Improvement Project, which comprised the development of several new hangars and associated apron space, and replacement of existing hangars, required the preparation of an Environmental Assessment (EA) in compliance with FAA's NEPA requirements.

Massport also meets monthly with the Hanscom Field Advisory Commission (HFAC) to review activities at Hanscom Field. HFAC was established by an act of the state legislature in 1980 and

The ESPR and Project review:

- ⇒ The ESPR does not replace the MEPA or NEPA review of specific projects at Hanscom Field.
- ⇒ Projects that meet or exceed regulatory thresholds (with the exception of routine maintenance and replacement projects) must comply with MEPA and NEPA environmental review requirements.
- ⇒ The ESPRs provide important cumulative context for these environmental reviews.
- ⇒ The ESPR ensures that the long-term planning activities inform the review and implementation of individual actions at Hanscom Field.

includes 16 members appointed by constituent groups and approved by the selectmen from the four host municipalities. HFAC includes representatives from the towns of Bedford, Concord, Lexington, and Lincoln; local citizens groups; other area towns affected by Hanscom Field; businesses basing aircraft at Hanscom Field; aviation or aviation-related businesses at Hanscom Field; and business aviation and/or general aviation organizations. The HFAC process provides an opportunity to review projects that are not subject to formal MEPA or NEPA review.

Massport filed the *2012 ESPR* in December, 2013 and the Secretary issued the MEPA Certificate on March 21, 2014, which determined that the *2012 ESPR* "adequately and properly complies with the Massachusetts Environmental Policy Act."

Using the 2012 Certificate as a starting point, Massport filed a proposed scope for the *2017 ESPR* with MEPA on October 2, 2017 and MEPA published notice of the proposed scope in the October 10, 2017 edition of the "Environmental Monitor." After a public comment period which

included a scoping meeting at Hanscom Field on October 24, 2017, the Secretary issued the scope for the *2017 ESRP* in its Certificate on November 16, 2017.

Detailed ESRP technical studies are summarized in a readable format to illustrate clearly the implications of recent trends, existing conditions and potential future scenarios. The ESRP presents policy considerations and an overview of the airport's current and potential future role within the regional planning context, including a status report on Massport's proposed planning initiatives and projects.

1.4 Development of the *2017 ESRP*

This section outlines the enhancements to the technical analysis since the *2012 ESRP*, describes the outreach program for the development of the *2017 ESRP*, and provides a schedule for the *2017 ESRP* public review and comment.

1.4.1 Technical Analysis and Data Gathering for the *2017 ESRP*

Massport has responded to the Secretary's Certificate and prepared a detailed study of existing and projected future conditions at Hanscom. The *2017 ESRP* includes a comprehensive analysis of information collected over the past three ESRPs to show important trends in Hanscom activities and in regional activities and the associated trends in environmental conditions over time. The preparation of forecast scenarios for the two planning years (2025 and 2035) based on realistic development assumptions provides a practical and effective way to evaluate potential future environmental effects.

Issues that are addressed in the *2017 ESRP* include airport facilities and infrastructure; aviation activity levels; airport planning; regional transportation context; ground transportation; noise; air quality; wetlands, wildlife, and water resources; historical and cultural resources; sustainability, environmental management, and a summary of potential beneficial measures. Technical appendices are provided, along with responses to comments on the proposed *2017 ESRP* Scope and supportive material for the technical studies.

1.4.2 Outreach for Preparation of the *2017 ESRP*

In addition to the MEPA scoping process, Massport engaged with state, regional and local agencies and commissions in the preparation of the *2017 ESRP*, and provided a briefing on the project to the Hanscom Field Advisory Committee (HFAC) (correspondence with agencies and organizations is included in Appendices C, F and G).

Massport sent letters to each of the local Historic Commissions and participated at one of their regularly scheduled public meetings where the *2017 ESRP* planning effort was described and input solicited. Specifically, each commission was asked to discuss any updates to cultural and

historic resources since 2012 that should be included in the *2017 ESRP*. This information has been incorporated into Chapter 10 Cultural and Historical Resources.

Massport also contacted the planners from the surrounding four towns informing them of the *2017 ESRP* and requesting information about planned development and infrastructure projects, the status of their long-range comprehensive plans and changes in conservation and recreational land. This information has been incorporated in Chapter 4 Airport Planning, Chapter 6 Ground Transportation, and Chapter 10 Cultural and Historical Resources.

MMNHP staff reviewed existing material about the Park and provided updates. Staff from the Hanscom AFB provided information about their recent and upcoming development projects and sustainability efforts as part of the data collection process for the *2017 ESRP*. Finally, all Hanscom Field tenants were contacted to provide information, including their environmental management activities, sustainable development, vehicle and fuel use, spill information, and planned developments for example. This information is contained in Chapter 2 Facilities and Infrastructure, Chapter 4 Airport Planning, Chapter 6 Ground Transportation, Chapter 8 Air Quality, and Chapter 11 Sustainability and Environmental Management.

Finally, Massport coordinated with the FAA for the preparation of the *2017 ESRP*. Hanscom Field is under the purview of the FAA's New England Region, whose regional office is located in Burlington, Massachusetts. The FAA administers the Airports Improvement Program (AIP), which provides grants for planning and development projects, funded through user fees and fuel taxes. The FAA provides air traffic control and navigation services and is the regulator of the airport and airspace system to ensure safe and efficient operations at public-use airports, including Hanscom Field. Lastly, as a federal agency the FAA is responsible for implementing NEPA. The FAA is therefore an important stakeholder in the *ESRP* development process, and a central partner to Massport in the operation of Massport facilities.

1.5 Primary Findings of the *2017 ESRP*

This section provides a summary of the *2017 ESRP* key findings, corresponding with the subject matter of each chapter, in the order in which they appear in this document.

1.5.1 Airport Facilities and Infrastructure

Since the *2012 ESRP*, Massport has made key improvements to fundamental airport infrastructure at Hanscom Field and third-party developers have upgraded corporate aviation facilities. Chapter 2 contains a listing of significant projects by year in its Key Findings section and details of each in the subsequent sections. These include rehabilitation of pavement in

multiple areas, relocation of portions of the perimeter road, construction of Rectrix² and Jet Aviation fixed-base operator facilities, commencement of Massport Fire-Rescue operations, and the reconstruction of Runway 11/29.

1.5.2 Airport Activity Levels

Chapter 3 details the airport activity levels. In 2017 Hanscom Field accommodated approximately 129,000 day-time aircraft operations (7:00 AM-11:00 PM, the hours that the air traffic control tower (ATCT) is open), and 1,902 nighttime operations^{3, 4} (11:00 PM – 7:00 AM), with GA accounting for over 99 percent, and military operations accounting for the remainder. More than 60 percent of the operations performed at Hanscom in 2017 were in single-engine piston (SEP) aircraft, consisting primarily of training operations and recreational or personal flying. Business aviation operations conducted in jets, turboprops, and multi-engine piston aircraft accounted for 32 percent of Hanscom's activity (see Table 1-1). The airport has not had scheduled passenger commercial service since 2012, when the last ESPR was completed.

Hanscom Field's total aircraft operations have declined from approximately 166,000 day-time operations in 2012. Although GA activity nationwide has decreased, the decline in operations at Hanscom Field has been more pronounced. However, the business aviation activity at Hanscom Field has mirrored the growth of the Massachusetts economy, continuing the growth trend observed in the previous ESPR following the 2008 recession. Overall business aviation operations (in both propeller and jet aircraft, combined) increased at an annual rate of 2.6 percent from 2012 to 2017.

Though total operations decreased between 2012 and 2017, operations by jet aircraft and the number of nighttime flights increased. Construction at Boston Logan International Airport in 2017 caused some aircraft to operate out of Hanscom Field that otherwise would have operated out of Logan Airport, contributing to some of the increase in jet aircraft activity. In addition, Runway 11/29 was closed for repaving during the month of August 2017, which caused an increase in operations on Runway 5/23 for the duration of that project. As discussed

² On February 15, 2019 Ross Aviation completed its acquisition of Rectrix Aviation. Ross Aviation facilities will retain the Rectrix brand at Hanscom Field, and is therefore referred to as Rectrix throughout the 2017 ESPR. See "Ross Aviation Completes Acquisition of Rectrix Aviation" (February 15, 2019). Available at: <http://www.rossaviation.com/news/ross-aviation-acquires-rectrix-aviation>

³ The definition of "nighttime" operations under Massachusetts law, and as reported in the Hanscom Field Annual Noise Report is from 11:00 PM to 7:00 AM. The FAA defines "nighttime" as the period from 10:00 PM to 7:00 AM for the purposes of calculating exposure to aircraft noise with the Day-Night Sound Level (DNL) metric. Therefore, the number of operations characterized as "nighttime" for use in determining DNL (described in Chapter 7 of this document) is higher than the number of nighttime operations reported in this chapter.

⁴ Massport's official aircraft operation counts are based on the FAA Air Traffic Control Tower (ATCT) counts from 7:00 AM to 11:00 PM when the tower is operational. In 2017, there were 1,902 additional aircraft operations during the late night / early morning hours when the tower is closed. The nighttime operations presented in the 2017 ESPR differ from those published in the Hanscom Field Annual Noise Report. This discrepancy is due to the difference in the timing of the preparation for the two reports. Each report used the best available data at the time of the analysis for that report. The difference of approximately 0.4 daily nighttime operations, or 0.3% of all daily operations would change computed noise levels by an imperceptible amount and would not change the conclusions of the analysis as presented.

later in this chapter and in Chapter 7 Noise, the shape of the 2017 noise contours reflect increased operations on Runway 5/23.

Total aircraft operations are forecast at 131,900 in 2025 and 138,840 in 2035. This is an annual forecast growth rate of 0.4 percent, consistent with the FAA's national forecast.⁵ Business aviation is the driver of the growth with an annual growth rate of 1.9 percent through the forecast period. Although the forecast does plan for a small number of possible future scheduled commercial traffic, it assumes that Hanscom Field will continue to function primarily as a GA reliever for Logan Airport, and as the premier business aviation airport in the Greater Boston area. The current forecast levels for 2025 and 2035 remain below the actual 2012 levels and below forecast levels for 2020 and 2030, respectively, at Hanscom Field.

Table 1-1 Summary of Aircraft Activity at Hanscom Field, 2005 – 2017

Activity	Year			Compound Annual Growth Rate (CAGR) ²	
	2005	2012	2017	2005-17	2012-17
Aircraft Operations (7:00AM-11:00PM)¹					
General Aviation					
Training (SEP)	58,535	70,196	46,014	-2.0%	-8.1%
Personal Flying (SEP)	57,894	51,477	33,040	-4.6%	-8.5%
Business Non-Jet (MEP+Turbo)	9,646	10,178	10,846	1.0%	1.3%
Business Jet	32,345	25,638	29,862	-0.7%	3.1%
Helicopter	7,004	7,345	8,256	1.4%	2.4%
Subtotal GA	165,424	164,834	128,018	-2.1%	-4.9%
Military	904	745	759	-1.4%	0.4%
Commercial Scheduled Airline	3,627	635	0	-100.0%	-100.0%
Total Operations	169,955	166,214	128,777	-2.3%	-5.0%
Based Aircraft	387	340	350	-0.4%	0.6%
Note: 1. Operations between 7:00 AM and 11:00 PM, the hours that the air traffic control tower is open. 2. Average growth rates over multi-year periods are calculated using compounded annual growth rates, or CAGR. The CAGR is the annual growth rate from the Year 1 value (e.g., aircraft operations, etc.) to the value at the end of the historic or forecast period, with the effect of compounding taken into account. This accurately measures the year-to-year growth. Source: 2012 ESPR for Hanscom Field and Massport EXP NOMS System.					

⁵ FAA Aerospace Forecast 2018-2038

1.5.3 Airport Planning

Planning for Hanscom Field, described in detail in Chapter 4, describes scenarios that could occur depending on the future demand. The planning scenarios in Chapter 4 are based on the airport activity levels that have been forecast for 2025 and 2035 in Chapter 3. The planning concepts take into account the 1978 Master Plan and Massport's 1980 Regulations, which establish the general planning framework for Hanscom Field. Detailed environmental analysis would occur for projects that move from conceptual screening to the proposal stage when those projects exceed MEPA or NEPA review thresholds.

Massport Regulations and Noise Rules contain the following provisions:

- 1) Limit scheduled commercial airline service to passenger aircraft with 60 seats or less;
- 2) Impose a nighttime field use fee to discourage activity between 11:00 PM and 7:00 AM;
- 3) Prohibit touch-and-go operations between the hours of 11:00 PM and 7:00 AM;
- 4) Prohibit touch and go operations at any time by aircraft exceeding 12,500 pounds;
- 5) Limit APU and GPU usage to 30 minutes, with further limitations between 11:00 PM and 7:00 AM.

The five planning areas described in Chapter 4 Airport Planning include:

- ⇒ North Airfield;
- ⇒ Northeast Airfield;
- ⇒ East Ramp;
- ⇒ West Ramp; and
- ⇒ Pine Hill.

This ESPR assesses current planning initiatives and projects at Hanscom Field, and compatible development consistent with activity forecasts for the 2025 and 2035 planning scenarios.

Table 1-2 summarizes the current planning initiatives and projects at Hanscom Field, supporting Hanscom Field's role as a premier full-service GA airport. Figure 1-3 depicts the possible location of planning initiatives and concepts in the 2025 and 2035 scenarios.

Massport also considers the following when formulating the plan for the future development of the Airport:

- ⇒ FAA Advisory Circular 150/5070-6b, *Airport Master Plans*;⁶

⁶ FAA. January 27, 2015. Advisory Circular 150/5070-6b Change 2.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_150_5070-6B_with_chg_1&2.pdf

- ⇒ FAA Advisory Circular 150/5300-13, *Airport Design*,⁷
- ⇒ FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*;
- ⇒ FAA Terminal Area Forecast for the airport;
- ⇒ Federal, state, and local environmental regulatory requirements and review processes;
- ⇒ Executive Order 385, *Planning for Growth*⁸, (Growth Management Policy for Massachusetts);
- ⇒ Executive Order 438, *State Sustainability Program*⁹, which initiated the new State Sustainability Program;
- ⇒ Regional planning framework and local comprehensive and growth management plans; and
- ⇒ Long-range plans for the MMNHP and Hanscom AFB.

This approach provides a planning context for potential improvements at the airport.

⁷ FAA. February 26, 2014. Advisory Circular 150/5300-13 Change 1.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5300-13A-chg1-interactive-201804.pdf

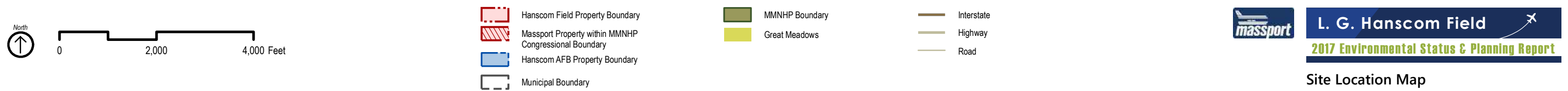
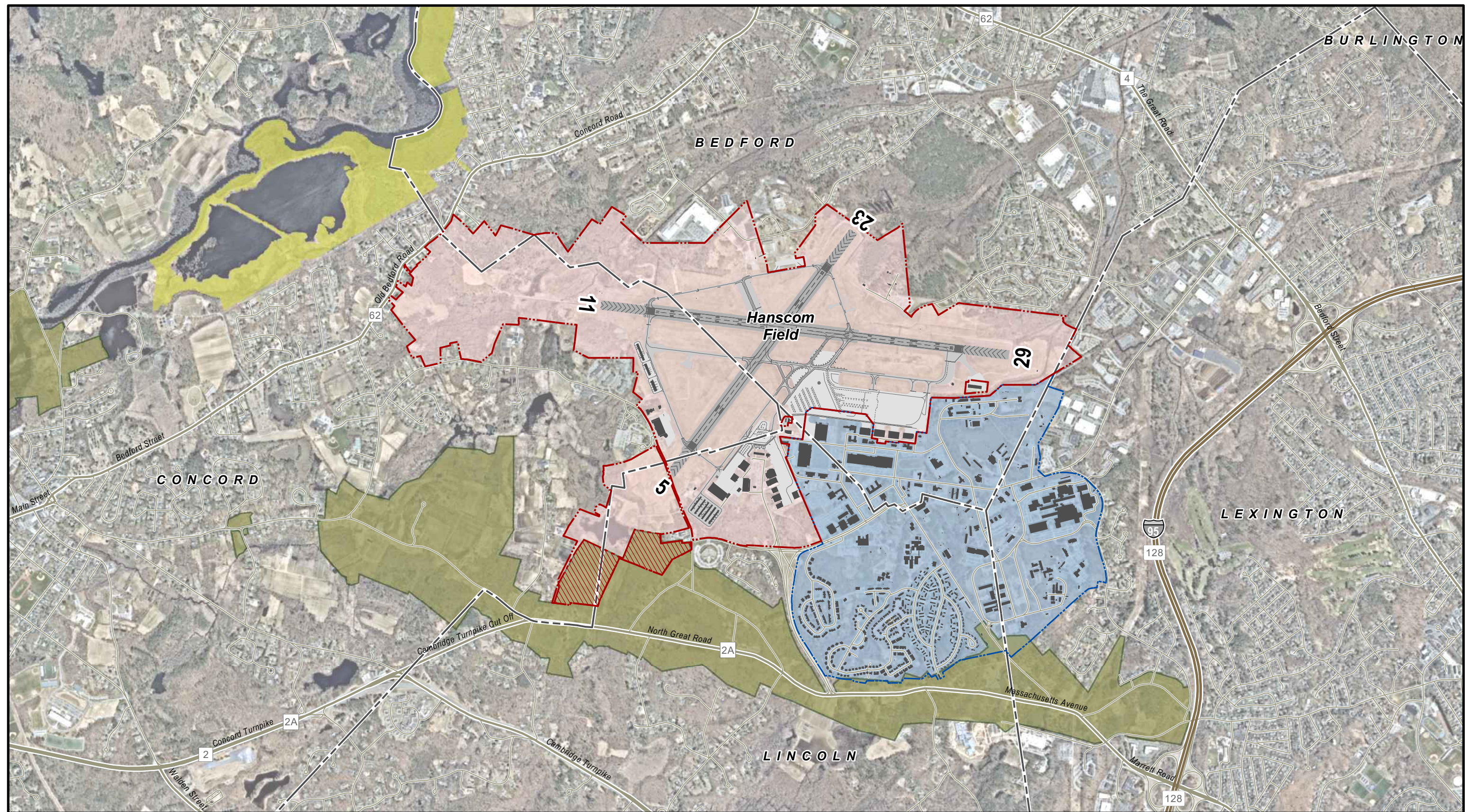
⁸ Commonwealth of Massachusetts. April 23, 1996. *Executive Order 385: Planning for Growth*. <https://www.mass.gov/executive-orders/no-385-planning-for-growth>

⁹ Commonwealth of Massachusetts. July 23, 2002. *Executive Order 438: State Sustainability Program*. <https://www.mass.gov/executive-orders/no-438-state-sustainability-program>

Table 1-2 2025 and 2035 Hanscom Field Planning Concepts

Planning Area	2017 Existing Uses	2025 Scenarios (2017 – 2025)	2035 Scenarios (2026 – 2035)
North Airfield	Currently vacant	General aviation (GA) facilities with aircraft parking utilizing existing impervious surface where possible.	Additional GA Hangars.
Northeast Airfield	Currently vacant	None	Development reserve on Parcel B site, upon reversion to Massport.
East Ramp	General aviation, including FBO and fueling facilities	GA facilities with new aircraft parking spaces; Expansion of GA facilities and upgrading or replacement of existing GA hangars; Expansion of the airport maintenance facility.	GA facilities with new aircraft parking spaces; Alternative landside access; Further expansion of the airport maintenance facility.
West Ramp	General aviation, including FBO and T-hangars; Civil Air Terminal	Upgrading or replacement of GA facilities with new aircraft parking spaces; Salt storage facility relocation; Civil Air Terminal enhancements.	New GA hangars; Civil Air Terminal enhancements; New and replacement public parking spaces as needed; Land reserved for development along Hanscom Drive (prior potential projects have been identified as office space, a hotel, and a museum). Precise use to be determined by demand.
Pine Hill	GA including T-hangars and FBO	GA facilities with new aircraft parking spaces.	Additional GA facilities.
Source: Massport 2018.			

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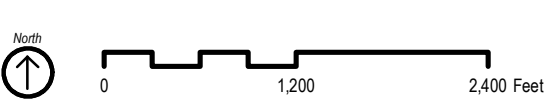
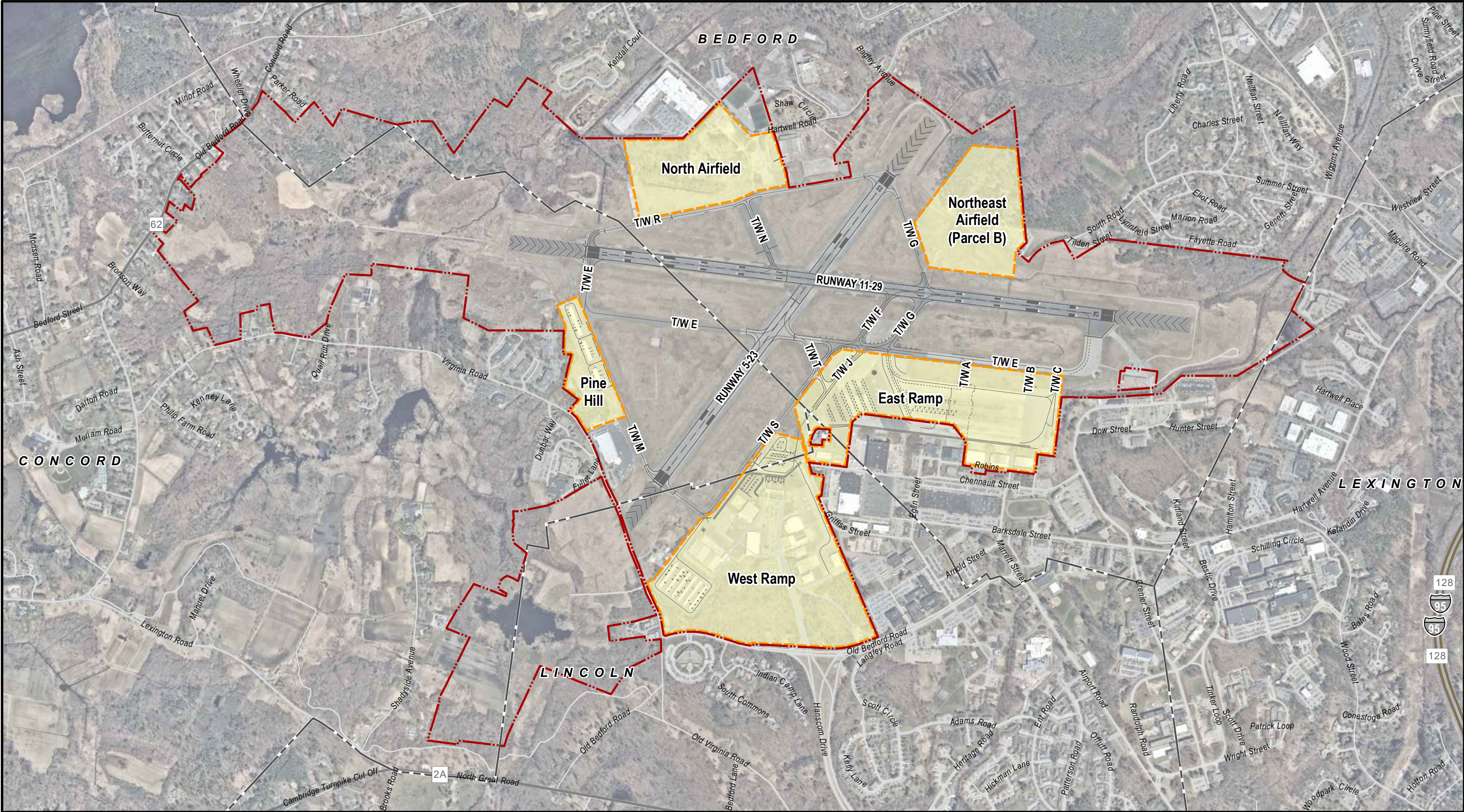


Data Sources: MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure 1-3



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- Hanscom Field Property Boundary
- Planning Area
- Municipal Boundary



L. G. Hanscom Field
2017 Environmental Status & Planning Report

Planning Areas

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018;
July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NearMap USA (Aerial) July 30, 2018

Figure 1-4

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1.5.4 Regional Transportation Context

Massport advocates a multi-modal regional transportation policy to improve the efficient use of the region's transportation infrastructure by appropriate use of regional airports and alternative transportation modes. Massport has formed partnerships with federal, state, and regional agencies to improve inter-city travel options for the New England region by supporting an integrated, multi-modal, regional transportation network.

Within this context, Massport is committed to maintaining Hanscom Field as a vital transportation resource within the regional airport system. Because of its proximity to Boston and Route 128/I-95 area businesses that rely on corporate aviation, Hanscom Field handles more GA activity than any other airport in the region. GA operations at airports in the greater Boston area fell by about 3 percent per year between 2012 and 2017, which is a slightly greater decline than the national trend. GA activity levels at Hanscom Field declined at an average compound annual rate of about 5 percent during the same years.

Hanscom Field will continue to function within the regional airport network primarily as a GA reliever for Logan Airport. Chapter 5 details the roles of all the airports in the region.

Table 1-3 General Aviation Operations at Airports in the Boston Metropolitan Area

Airport	NPIAS Category ¹	2012 General Aviation ²		2017 General Aviation ²	
		Operations	Percent	Operations	Percent
Hanscom Field	Nonhub primary	164,834	29.2%	128,018	26.3%
Norwood Memorial	Nonprimary reliever	68,405	12.1%	66,823	13.7%
Nashua/Boire Field	Nonprimary reliever	55,620	9.9%	56,352	11.6%
Beverly Municipal	Nonprimary reliever	58,203	10.3%	53,401	11.0%
Laurence Municipal	Nonprimary reliever	52,157	9.2%	36,822	7.6%
Portsmouth International (Pease)	Nonhub primary	38,132	6.8%	36,717	7.6%
Boston Logan International	Large hub	28,144	5.0%	31,120	6.4%
Worcester Regional	Nonhub primary	44,070	7.8%	25,683	5.3%
T.F. Green	Small hub	26,274	4.7%	24,797	5.1%
Bradley International	Medium hub	15,589	2.8%	13,233	2.7%
Manchester-Boston Regional	Small hub	12,504	2.2%	13,169	2.7%
Total		563,902	100.0%	486,135	100.0%
Notes: 1. The National Plan of Integrated Airport Systems (NPIAS) includes all commercial service airports, all reliever airports, and selected public-owned general aviation airports. 2. Operations include itinerant air taxi, general aviation, and local civic operations. Manchester-Boston Regional, T.F. Green, and Bradley International Airport operations exclude air taxi operations as their operations counts are comingled with regional commuter airline operations. Sources: FAA Traffic Flow Management System Counts (TFMSC), FAA Terminal Area Forecast (TAF); Hanscom Field and Logan International Airport counts are provided by Massport.					

1.5.5 Ground Transportation

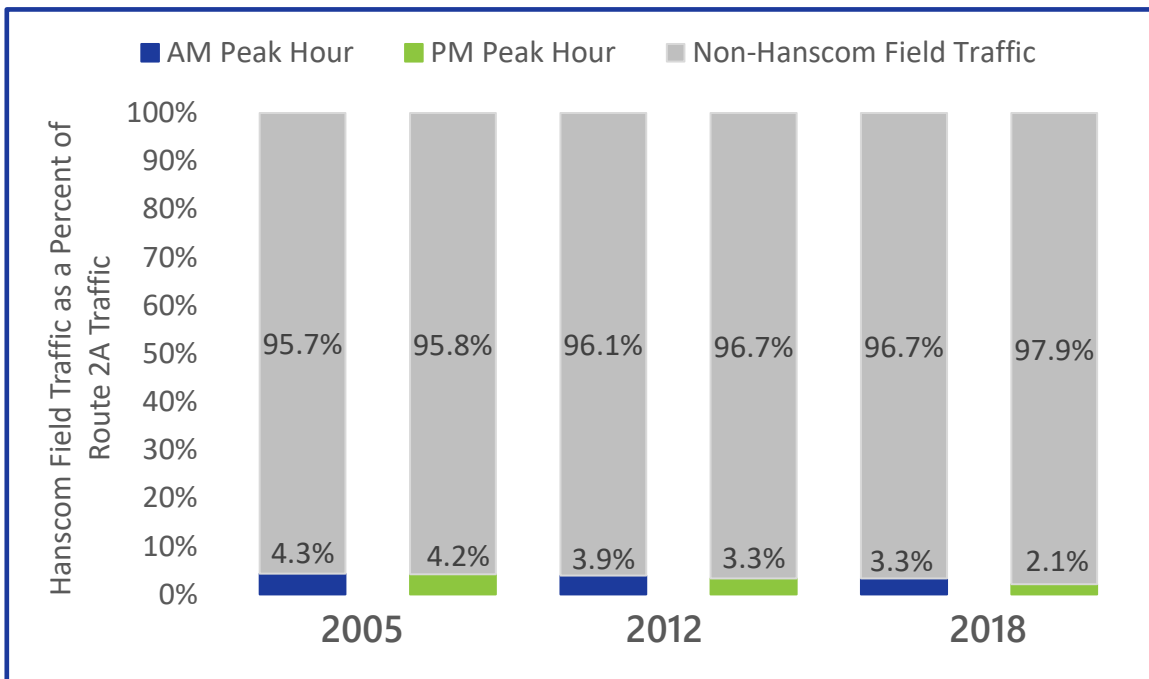
Chapter 6 provides analysis of Hanscom Field's relationship to local ground transportation systems. As reported in the *2012 ESPR*, Hanscom Field is not a significant contributor to traffic volumes on the roadways that surround the airport. Commercial and residential developments, coupled with reliance on single occupancy vehicles, remain the most significant source of traffic volume on area roadways. Hanscom Field traffic comprised only about 2 percent of both morning and afternoon peak hour traffic on Route 2A in 2018¹⁰, a decrease from almost 4 percent of traffic during the morning peak hour and about 3.3 percent during afternoon peak

¹⁰ Data collection for traffic analysis at Hanscom Field occurred in April of 2018, therefore when referencing ground transportation current conditions, the year 2018 is used as opposed to 2017 (the base year for the *ESPR* and other technical analyses).

hours in 2012 (see Figure 1-5). Hanscom Field traffic has decreased since 2012, while overall Route 2A peak hour traffic volumes have increased.

The projected increased amount of peak hour traffic volumes associated with Hanscom Field activity for the 2025 and 2035 forecast scenarios is tied to the projected increased in aviation activity. It is expected that Hanscom Drive traffic volumes measured as a percentage of total traffic on Route 2A would remain relatively stable throughout the forecast years, reaching 2.4 percent in 2035. Projected increases to peak hour traffic volumes generated by Hanscom Field return to levels similar to 2005, not representing a substantial increase from historical traffic volumes.

Figure 1-5 Percent of Hanscom Field Traffic on Route 2A East of Hanscom Drive



1.5.6 Noise

Overall, there has been a decrease in operations at Hanscom Field over the last several years, and operations remain well below historical peaks. Noise also remains well below historical peaks, with the Day-Night Sound Level (DNL) 65 decibel (dB) contour¹¹ entirely contained over Hanscom Field property. However, there have been some increases in jet operations and nighttime flights. Forecast increases in GA jet activity contribute to the growth in operations to

¹¹ FAA land use compatibility guidelines generally consider aircraft noise greater than 65 dB DNL to be incompatible with residential and other noise-sensitive land uses. No residential land uses were exposed to a DNL value above the FAA land use compatibility recommendation of 65 dB in 2017.

approximately 142,000 annual operations in 2035, driving a modest projected increase in overall noise levels in the future. Chapter 7 presents the current and forecast noise analyses.

As described in Section 1.5.2, the year 2017 was an anomaly for noise due to construction impacts. Construction at Boston Logan International Airport in 2017 caused some aircraft to operate out of Hanscom Field that otherwise would have operated out of Logan Airport. In addition, Runway 11/29 was closed for repaving during the month of August 2017, which caused an increase in operations on Runway 5/23 for the duration of that project. As a result, the shape of the 2017 noise contours reflect both increased jet operations and increased operations on Runway 5/23. The size and shape of the 55 dB contours in 2017 shows the effect of the temporary closure of Runway 11/29 with the increase in the contour lobes associated with Runway 5/23 operations, and increases due to flights diverted from Boston Logan due to construction (see Figure 1-6).

Due to the anomalous activity in 2017, Massport considered activity in years 2013 – 2016 as well as 2017 in developing the future year forecasts for noise impacts in 2025 and 2035. The methodology is further explained in Chapter 7.

Massport continues to implement an initiative begun in 2009 to reduce noise over the MMNHP. Using radar data, Massport staff monitors the number of touch-and-go operations over the MMNHP. This data is a critical part of ongoing quarterly meetings between Massport, FAA Air Traffic Control Tower, and flight school staff to review touch-and-go flight paths. Since the initiation of this program, flights over MMNHP have been reduced by 22 percent.

FAA land use compatibility guidelines generally consider aircraft noise greater than 65 dB DNL to be incompatible with residential and other noise-sensitive land uses. DNL 55 dBA is the level for analysis requested by MEPA.

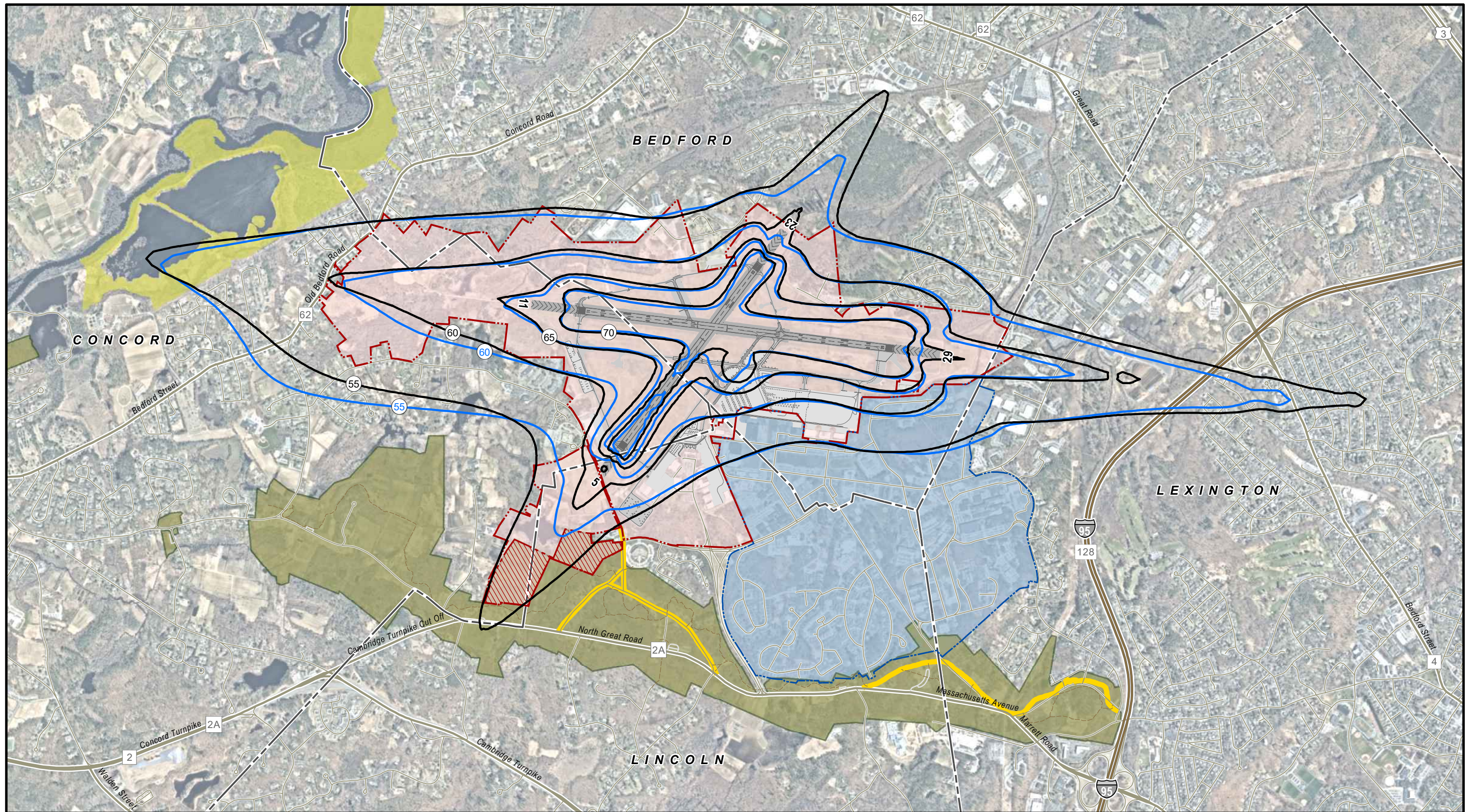
Comparison of year 2017 DNL noise contours to 2012 contours shows that overall noise levels have increased somewhat. No residential land uses were exposed to a DNL value above 65 dB in 2017. With the forecasted level of aircraft operations, noise is anticipated to increase in 2025 over 2017 and then again in 2035. However, noise in 2025 and 2035 is projected to remain lower than what was experienced in 2005. No residents are expected to be within the 65 dB contour, which will remain confined Hanscom Field property. Populations exposed to 55 dB DNL or greater in the forecast scenarios will remain below 2005 actual levels. Figure 1-6 provides a visual comparison of the 2012 and 2017 DNL noise contours.

The analysis of the 2025 and 2035 scenarios suggest that the greatest noise exposures would occur in the 2035 scenario since it has the highest projected activity levels. Even with activity increases over current levels, no noise analysis locations (including historic sites) would experience a DNL value greater than 60 dB under any future scenario. The Deacon John Wheeler/Capt. Jonas Minot Farmhouse in Concord, the Wheeler-Meriam House in Concord, and Simonds Tavern in Lexington are the only three historic sites that would experience noise levels between 55 and 60 dBA in the 2025 and 2035 scenarios.

No portion of the MMNHP is located in the 60 or 65 DNL contours in 2017 or in the forecasted 2025 and 2035 planning scenarios. The 2017 and forecast future 55 DNL contours do extend slightly into MMNHP. Only one of the 31 specified sites in MMNHP, Noah Brooks Tavern, experienced a DNL of 55 dB in 2017 due to higher than typical use of Runway 5/23 during the closure of Runway 11/29 in August 2017 for repaving. None of the 31 sites in the MMNHP are projected to experience a DNL value of 55 dB or greater for either of the future scenarios.

Noise and air emissions were modeled using FAA's Aviation Environmental Design Tool (AEDT), as required by the FAA. AEDT replaced FAA's prior model, the Integrated Noise Model (INM), which was used for previous ESPRs. Because AEDT is designed to model both noise and air emissions simultaneously, AEDT also replaced FAA's Emissions and Dispersion Modeling System (EDMS). Chapter 7 provides a more complete description of AEDT as it relates to noise modeling, and Chapter 8 and Appendix E provide a more complete description of the model changes for the air quality analysis.

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North
 0 2,000 4,000 Feet
 Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018;
 MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018;
 MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018;
 MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018

- | | | | | | |
|--|---|--|--------------------|--|---------------|
| | 2017 DNL Noise Contour | | Municipal Boundary | | Historic Road |
| | 2012 DNL Noise Contour | | MMNHP Boundary | | Interstate |
| | Hanscom Field Property Boundary | | Great Meadows | | Highway |
| | Massport Property within MMNHP Congressional Boundary | | | | Road |
| | Hanscom AFB Property Boundary | | | | Trail |

Figure 1-6



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1.5.7 Air Quality

The 2017 *ESPR* provides a current emissions inventory for six criteria pollutants (carbon monoxide, lead, nitrogen oxides, ozone, particulate matter and sulfur dioxide) as well as models future air emissions from aircraft operations and vehicular traffic. The six criteria pollutants are regulated by the National Ambient Air Quality Standards (NAAQS), set by the U.S. Environmental Protection Agency (EPA), and Massachusetts Ambient Air Quality Standards (MAAQS) set by MassDEP, to protect human health and welfare. Emissions of criteria pollutants from aircraft operations and motor vehicles accessing Hanscom Field represent a very small fraction of regional emissions.

Aircraft emissions data for all pollutants decreased between 2012 and 2017, except for carbon monoxide (CO) and nitrogen dioxide (NO₂) which increased (Table 1-4). These increases are primarily attributed to a change in modeling methodology (the use of FAA's Aviation Environmental Design Tool [AEDT] in place of FAA's older model, the Emissions and Dispersion Modeling System [EDMS]). Chapter 8 provides a detailed description of the air quality analyses and Appendix E provides additional information on the differences between AEDT and EDMS.

Future emissions from aircraft operations are expected to increase for NO₂, carbon dioxide (CO₂), volatile organic compounds (which do not have their own ambient air quality standards but are measured and modeled because they are precursors to ground level ozone), and particulate matter, based on the increase in forecasted activity levels presented in Chapter 3. Emissions levels of CO are anticipated to decrease based on estimated changes in the fleet mix over time (more jet aircraft and fewer single engine piston aircraft, as jet engines emit less CO than piston engines).

Forecasted emissions from vehicular traffic in 2025 and 2035 associated with Hanscom Field are modeled to decrease for CO, nitrogen oxides and volatile organic compounds (VOCs). They are modeled to decrease slightly for particulate matter in 2025 before increasing again to 2017 levels in 2035. These changes are anticipated to occur because of improvements in the average vehicle fleet fuel economy over time (assumed to be more efficient in future years).

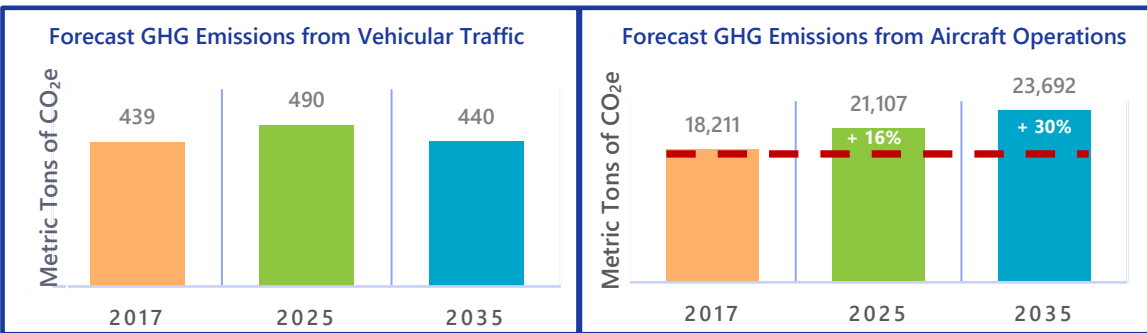
The forecasted emission levels from aircraft operations and motor vehicles for the future scenarios are not anticipated to result in adverse air quality effects. For all scenarios, air quality concentrations in Bedford, Concord, Lexington, Lincoln, MMNHP and GMNWR remain in compliance with the NAAQS and MAAQS.

The 2017 *ESPR* Scope Certificate requires the development of the first airport-wide Greenhouse Gas (GHG) emissions inventory for Hanscom Field, to be used as a baseline to measure and compare future GHG emissions reductions. As this is the first airport-wide GHG emissions inventory, there are no prior year comparisons. Overall, GHG emissions that are owned and controlled by Massport (such as vehicles owned by Massport and energy use in Massport buildings) are minor (approximately 5 percent over total GHG emissions) compared to sources of GHGs that are owned and controlled by tenants. GHG emissions from aircraft are expected to grow moderately in 2025 and 2035 (an increase of 16 percent and 30 percent over 2017

levels, respectively, as shown in Figure 1-7) consistent with the forecasted increase in activity levels described in Chapter 3. Because AEDT does not include assumptions about efficiency improvements in future aircraft models, these estimates are conservative.

GHG emissions from vehicular traffic are expected to grow in the 2025 scenario due to growth in operations, then decrease back down to current levels in 2035, due to anticipated efficiency gains in vehicle technology.

Figure 1-7 Forecast Greenhouse Gas Emissions from Vehicular and Aircraft Operations, in Carbon Dioxide Equivalent at Hanscom Field



Source: HMMH 2018.

Table 1-4 Total Air Emissions at Hanscom Field (1,000s of kg/yr)

Year	Source	CO	NO _x	VOC	PM ₁₀	PM _{2.5}	CO ₂ ¹
1995	Aircraft	409.2	14.9	27.9	2.3	2.3	6,728
	Ground Vehicles	30.3	3.9	2.9	0.6	0.6	-
	Total	439.5	18.8	30.8	2.9	2.9	-
2000	Aircraft	591.2	25.4	39.4	2.3	2.3	10,108
	Ground Vehicles	60.8	6.9	3.0	0.2	0.2	1,496
	Total	652.0	32.3	42.4	2.5	2.5	11,604
2005 (EDMS 5.1.4.1) ²	Aircraft	1,670.0	34.1	112.7	13.5	13.5	19,233
	Ground Vehicles	36.1	4.1	1.6	0.1	0.1	1,312
	Total	1,706.1	38.2	114.3	13.6	13.6	20,545
2012 ³	Aircraft	1,123.0	31.9	80.4	9.9	9.9	16,356
	Ground Vehicles	19.1	2.18	0.9	0.1	0.1	1,555
	Total	1,142.1	34.1	81.3	10.0	10.0	17,911
2017 (AEDT)	Aircraft	1,557.0	34.8	51.4	1.9	1.9	17,735
	Ground Vehicles	2.9	0.4	0.1	0.0	0.0	407
	Total	1,559.9	35.2	51.5	1.9	1.9	18,141

Notes:

1. Data to calculate the ground vehicle CO₂ emissions for 1985 and 1995 were not available; therefore, total CO₂ emissions for these years are not available for comparison with later years.
2. The 2005 *ESPR* used EDMS version 4.3 however the emissions were recalculated using EDMS version 5.1.4.1 when it was released for consistency with the 2012 *ESPR*.
3. The 2012 *ESPR* used EDMS 5.1.4.1.
4. Emissions of all pollutants except CO₂ are calculated to the first decimal place.

1.5.8 Wetlands, Wildlife and Water Resources

Wetlands, wildlife, and water resource areas at Hanscom Field are fundamentally unchanged from the 2012 *ESPR*. With only minor exceptions, the surrounding habitat areas are well established with little variation from year-to-year.

Updates to wetland mapping at Hanscom Field tend to occur on a project-by-project basis. There have been a series of airport facility and infrastructure improvements, initiatives, and/or studies undertaken at Hanscom Field since the 2012 *ESPR*. During the planning process for each of these improvements, project-specific wetland delineations, if needed, were undertaken. Section 9.2.2 of this document provides a complete listing of wetland resource areas at Hanscom Field and identifies projects which included wetland delineations over the past 20 years. Most new development is located outside of wetlands and buffer zones. Activities proposed in areas subject to review under the Massachusetts Wetlands Protection Act (MAWPA) are subject to review by the municipal conservation commission and Massport will make the necessary filings.

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) revised the statewide inventory mapping in 2016. As a result, some areas in the North Airfield area that were formerly designated as critical rare species habitat were no longer designated as such,

since those areas did not contain the requisite special habitat requirements of the rare bird species known to inhabit other areas of the airfield. NHESP has indicated that four species listed under the Massachusetts Endangered Species Act (MESA) have been found on Hanscom Field: two of these are bird species which were identified in the 2000 *ESPR*, and two are turtle species not previously listed. Work within mapped Estimated Habitat of Rare Species or certified vernal pools would need to be reviewed by the NHESP. Additionally, since the last *ESPR* document was published, the northern long-eared bat (*Myotis septentrionalis*) was listed as threatened under the Federal Endangered Species Act. As its range overlaps the Hanscom Field property, impact to this species would be considered in future activities on the property that result in tree disturbance.

Massport updated and revised the Hanscom Field SWPPP in October 2015 in compliance with the Stormwater Multi-Sector General Permit that was reissued under the NPDES in June 2015.

Massport continues to comply with its Spill Prevention Control and Countermeasure (SPCC) Plan. The "State of Hanscom" reports indicate that there have been 16 fuel spills at Hanscom Field since 2012, only four of which involved a reportable quantity necessitating reporting to MassDEP. Appropriate measures were taken to protect the environment regardless of the Responsible Party or spilled quantity.

1.5.9 Cultural and Historical Resources

The Massachusetts Historical Commission (MHC) maintains the State Register of Historic Places, MHC Inventory, and the Massachusetts Cultural Resource Information System (MACRIS). These resources provided baseline information for Bedford, Concord, Lexington, and Lincoln, which was supplemented through research of the MHC Inventory and the MACRIS files, discussions with the historic commissions for each of the four towns and research of their files, and discussions with the National Park Service (NPS). The inventory of existing cultural and historical resources included the identification of historic buildings and landscapes in MMNHP.

The 2017 *ESPR* updates the 2012 *ESPR* comprehensive reconnaissance survey (that was initially completed for the 2005 *ESPR*) of historic and archaeological resources that are listed in or eligible for the National and State Registers, in the state inventory and the Massachusetts Cultural Resource Information System (MACRIS), or are 50 years or older.

This study showed that currently there are a total of 65 historic properties, 41 individual properties and 24 districts, with the MMNHP counted as one district included in, or determined eligible for the National and State Registers. These properties include 13 National Historic Landmarks (NHL), with the MMNHP counting as one NHL. The 2017 survey update includes a few additional resources within the four Hanscom towns (properties that are now more than fifty years old). There have been no changes to the historic resources within the boundaries of MMNHP. The NPS has identified approximately 106 historic resources that contribute to the historical significance of MMNHP.

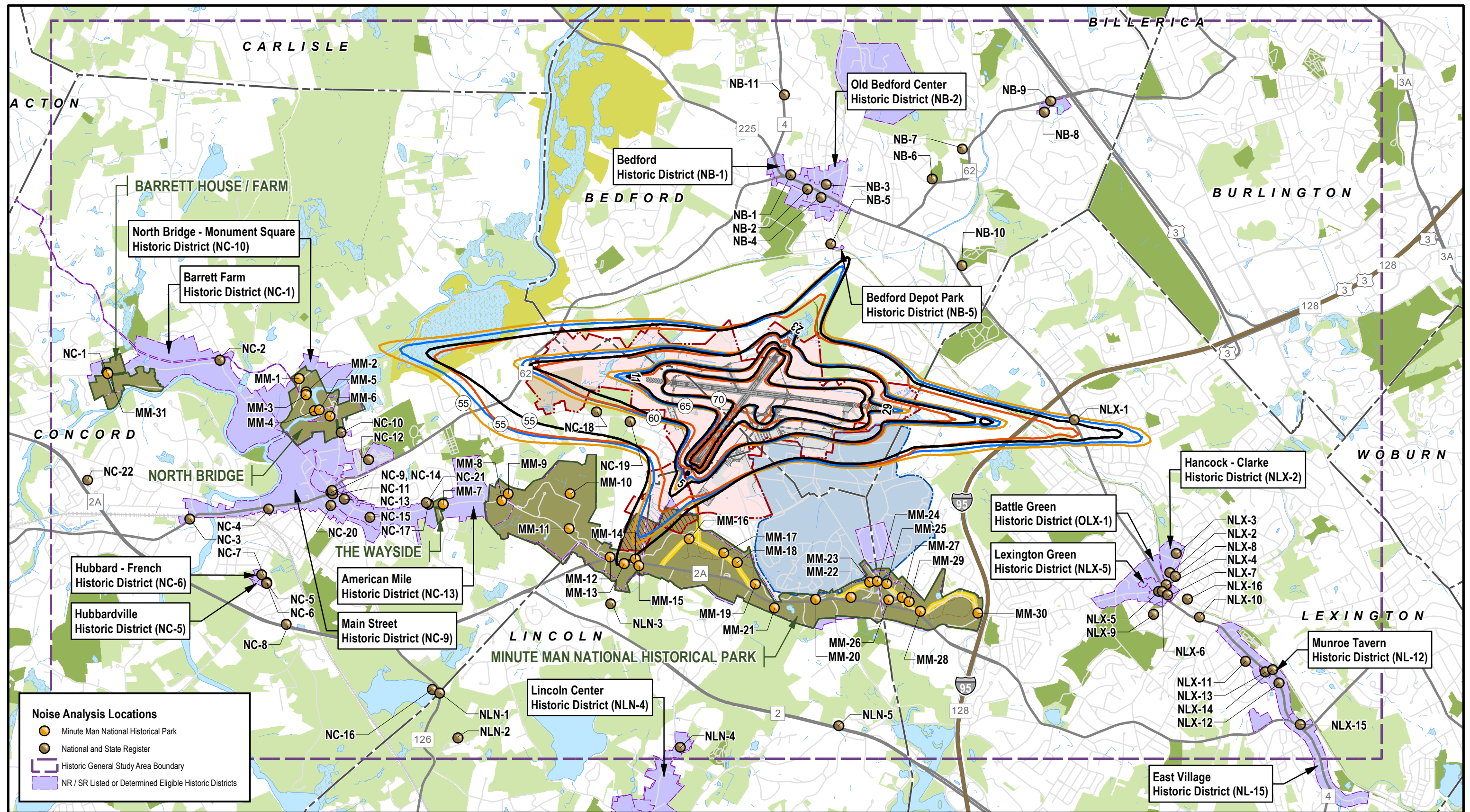
Chapter 10 describes the potential environmental effects of traffic, air quality, and noise on cultural and historical resources. The findings documented in Chapters 6 and 8 show that the environmental effects of traffic and air quality on cultural and historic resources have decreased between 2012 and 2017, both of which decreased from 2005. There are no expected adverse effects attributable to air quality in 2017 or under the 2025 and 2035 scenarios for any cultural and historic resources. The noise analysis conservatively incorporates the largest area potentially affected based on the maximum forecasted noise values; this is the area within the 2035 planning year 55 DNL noise contour line.

Table 1-5 lists noise exposure for State Register properties, the MMNHP, Great Meadows National Wildlife Refuge (GMNWR), and key conservation and recreational facilities, comparing 2012 and 2017 to the 2025 and 2035 forecast year scenarios. Figure 1-8 illustrates the location of historic resources relative to noise contours for each of those years. No historic buildings, historic districts, or cultural resources have exposure above 65 dB DNL in 2017 or in either of the forecast scenarios.

The analysis completed for the *2017 ESPR* found little change in the status of archaeological information since the reconnaissance survey conducted for the *2005 ESPR* and the *2012 ESPR* update. Massport encourages new development in areas with existing impervious or disturbed surfaces that take advantage of existing infrastructure. The update for the *2017 ESPR* determined that no new archaeological sites have been identified within study area.

Table 1-5 Summary of Noise Effects on Cultural and Historic Resources

Resource ¹	Total Quantity ²	Properties/Geographic Areas within 65 DNL Contour ³			
		2012	2017	2025	2035
National and State Registers Individual Properties ⁴	41 properties	0 properties	0 properties	0 properties	0 properties
National and State Register Historic Districts ⁵	1646.2 acres	0 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975.4 acres	0 acres	0 acres	0 acres	0 acres
Battle Road Interpretive Trail	4 miles	0 miles	0 miles	0 miles	0 miles
Resource ¹	Total Quantity ²	Properties/Geographic Areas within 55 DNL Contour			
		2012	2017	2025	2035
National and State Register Individual Properties ⁴	41 properties	3 properties	3 properties	3 properties	3 properties
National and State Register Historic District ⁵	1646.2 acres	0 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975.4 acres	0 acres	55 acres	30 acres	43 acres
Battle Road Interpretive Trail	4 miles	0 miles	0 miles	0 miles	0 miles
Notes:					
1. See Tables 10-2 through 10-5 for more detail on National and State Registers individual properties and historic districts.					
2. All surveyed historic properties; total acreage of surveyed historic districts and Minute Man National Historical Park.					
3. This is the exposure level that the FAA identifies as a guideline for determining potential land use incompatibilities.					
4. In General Study Area. Does not include Minute Man National Historical Park sites. In this table, the noise effects are quantified through the estimation of park acreage within a given contour.					
5. In General Study Area. Includes Bedford Depot Park Historic Dist., Bedford Historic Dist., and Old Bedford Center Historic Dist. in Bedford; American Mile Historic Dist., Barrett Farm Historic Dist., Concord Monument Square-Lexington Road Historic Dist., Hubbard-French Historic Dist., Hubbardville Historic Dist., Main Street Historic Dist., and North Bridge-Monument Square Historic Dist. in Concord; Battle Green Historic Dist., East Village Historic Dist., Hancock-Clarke Historic Dist., Lexington Green Historic Dist. and Munroe Tavern Historic Dist. in Lexington; and, Lincoln Historic Dist. in Lincoln. Areas of overlap in districts are counted once.					



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018



L. G. Hanscom Field

2017 Environmental Status & Planning Report

Historic Resources within the
2012, 2017, 2025 and 2035 DNL
Noise Contours



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1.5.10 Sustainable Development / Environmental Management

Massport is a leader among Massachusetts agencies in the promotion and implementation of sustainable design and operations. In 2015, Massport developed a Sustainability Management Plan (SMP) for Logan Airport and the following year, Massport published its first Boston Logan International Airport Annual Sustainability Report to document the progress and challenges of its sustainability initiatives included in the SMP. In 2018, Massport expanded the scope of the Sustainability and Resiliency Report to include all of its facilities, including Hanscom Field.¹² Chapter 11 details the current environmental sustainability initiatives at Hanscom Field.

Massport continues to build on its efforts and commitments to sustainable development. Massport requires that all new development, including development at Hanscom and by its tenants, meet the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Silver certification requirements.¹³ LEED certification is achieved through the incorporation of sustainability commitments in building design and operation, including energy efficiency, water efficiency, use of environmentally friendly building materials and products, reuse and recycling, and renewable energy.

1.5.11 Environmentally Beneficial Measures

Environmentally beneficial measures are those actions identified in each of the technical chapters of the ESPR that could be implemented to minimize potential effects of existing activities at Hanscom. Massport recognizes the importance of operating and developing Hanscom Field in a manner that maximizes its contribution to the regional transportation system while minimizing potential impacts on local communities and stakeholders.

The aviation activity forecasts that are described in Chapter 3 provide for a realistic and practical level of growth based on local and national aviation trends, including forecasts from the New England Regional Aviation System Plan. The 2025 and 2035 scenarios represent estimates of what could occur in the future, using certain planning assumptions, and are highly dependent on demand. In accordance with the EEA Scope Certification for the 2017 ESPR, Table 11-2 presents the environmentally beneficial measures in place at Hanscom, along with the responsible parties, implementation schedule, and the estimated cost (where applicable and data is available) for each measure. Additional details are described in section 11.6.

¹² Massport. 2018. *Sustainable Massport, Annual Sustainability & Resiliency Report*.

http://www.massport.com/media/2774/massport-annual-sustainability-and-resiliency-report-2018_lr.pdf

¹³ The U.S. Green Building Council LEED Green Building Rating System is a global framework to guide the development of sustainable, energy-efficient buildings.

1.6 MEPA Documentation

Appendix A of the 2017 *ESPR* contains the Proposed Scope submitted to the MA Executive Office of Energy and Environmental Affairs, the MEPA certificate, the response to all comments and copies of all comments received on the Proposed Scope.

The 2017 *ESPR* is posted on Massport's web site and is publicly available.¹⁴ Hard copies of the report are available upon request. All four town libraries, town planning departments, conservation commissions, MMNHP, and individuals who submitted comments on the 2012 *ESPR* or the 2017 *ESPR* scope received printed copies of the 2017 *ESPR*. Other entities listed in the Distribution List in Appendix A were provided with a notice of availability letter, which shares the link to the electronic version of the document on Massport's website.

In addition to the *ESPR* process, Massport publishes two annual reports for public review: the "State of Hanscom" and the "Annual Noise Report." Both documents are distributed to the Hanscom Field Advisory Commission (HFAC) and are available on Massport's website. The "State of Hanscom" describes Massport's financial performance, economic benefits and accomplishments, as well as its plans for the near future. The report also includes information on aircraft activity from the past year. Massport will continue to use this process to distribute information about Hanscom Field. The first noise report for Hanscom Field was prepared in 1982, and it compared data for 1978 and 1981. Annual updates were started in 1984 (based on the previous year's data), making 2017 the 36th Hanscom noise report.

All projects that meet the threshold for NEPA or MEPA review undergo project-specific environmental analysis. These documents are also available on Massport's Project Environmental Filings website, organized by airport.¹⁵

¹⁴Massport Project Environmental Filings website for Hanscom Field can be accessed at:

<http://www.massport.com/massport/about-massport/project-environmental-filings/hanscom-field/>

¹⁵ Massport Project Environmental Filings website for all Massport facilities can be accessed at:

<http://www.massport.com/massport/about-massport/project-environmental-filings/>

1.7 Organization of the 2017 *ESPR*

The 2017 *ESPR* contains planning information, technical analyses, and supportive data, including the Secretary's November 16, 2017 Scope Certificate, comment letters on the Draft Scope for the 2017 *ESPR*, responses to the Certificate and the comment letters, a list of reviewers and technical appendices. The Executive Summary provides a brief overview of the content and key findings of each chapter. The technical appendices provide additional analytical data and methodological documentation for the various environmental analyses conducted for this 2017 *ESPR*.

Chapter 1: Executive Summary

- ⇒ Provides background of Hanscom Field
- ⇒ Discusses the environmental and regulatory context
- ⇒ Identifies the analytical framework for the *ESPR*
- ⇒ Presents an overview of the outreach program and public engagement process
- ⇒ Summarizes the primary changes since 2012
- ⇒ Provides the organization for the report

Chapter 2: Airport Facilities and Infrastructure

- ⇒ Describes the airfield and its supporting infrastructure, including parking and utility systems serving the airport
- ⇒ Provides an assessment of facilities in inventory
- ⇒ Provides information about the tank management program and hazardous material spill prevention efforts at Hanscom Field

Chapter 3: Airport Activity Levels

- ⇒ Presents an overview of national General Aviation trends
- ⇒ Quantifies the aircraft operations at Hanscom Field in 2017 in comparison to previous years, and in the context of operations at other regional airports
- ⇒ Compares the 2017 data to prior forecasts from the 2012 *ESPR*
- ⇒ Presents 2025 and 2035 aircraft operation and air passenger forecasts for the future planning scenarios
- ⇒ Discusses nighttime aircraft operations

Chapter 4: Airport Planning

- ⇒ Describes the status of planning initiatives and projects for the five planning areas (North Airfield, Northeast Airfield, East Ramp, West Ramp, Pine Hill)
- ⇒ Evaluates the potential effects of the 2025 and 2035 scenarios on the airport infrastructure
- ⇒ Presents the relationship between the 2017 *ESPR* and FAA regulations and guidance related to airport planning
- ⇒ Describes projects in the five-year capital improvement program and identifies which projects may require individual MEPA or NEPA review

- ⇒ Updates any new planning and development initiatives at the MMNHP, Hanscom AFB, and the four contiguous towns

Chapter 5: Regional Transportation Context

- ⇒ Provides a summary of the regional transportation system
- ⇒ Describes the role of Hanscom Field in the region's transportation system
- ⇒ Describes aircraft activities and planned improvement projects at other regional airports
- ⇒ Discusses rail and ground access improvements in the region

Chapter 6: Ground Transportation

- ⇒ Reports on current conditions and potential conditions in the 2025 and 2035 analysis years for traffic, roadway and access, including intersection operations and Average Daily Traffic volumes
- ⇒ Provides mode share data including tenant survey results
- ⇒ Describes the review process with local towns; presents information on Transportation Demand Management
- ⇒ Reviews, summarizes and analyzes existing metropolitan planning documents
- ⇒ Discusses the status of existing and future parking needs at Hanscom Field

Chapter 7: Noise

- ⇒ Updates the status of the noise environment around Hanscom Field for 2017 conditions and for the 2025 and 2035 analysis years, including the following:
 - Total Noise Exposure (EXP) calculations
 - DNL, Time-Above (TA) and Single Event contours
 - Single Event Level (SEL) Distribution metrics
 - Ranked tabulation of take-off noise levels
- ⇒ Reports past trends and the projections for the forecast activity levels and years and adjustments for such changes in the Integrated Noise Model (INM)
- ⇒ Addresses engine run-ups and the operation of Auxiliary Power Units and Ground Power Units
- ⇒ Addresses measures to reduce noise impacts from airport operations

Chapter 8: Air Quality

- ⇒ Reports on 2017 conditions and conditions in the 2025 and 2035 analysis years including the following:
 - Carbon monoxide
 - Oxides of nitrogen
 - Volatile organic compounds
 - Particulate matter
 - Monitoring results for ozone precursors and nitrogen dioxide
 - Summary of national lead emission standards
- ⇒ Presents a review of environmentally beneficial measures including the following:
 - Ground service and landside conversion to alternative fuels
 - Building heating and cooling
 - Aviation support emissions reductions
 - Clean fuel vehicle program at Hanscom Field

Chapter 9: Wetlands, Wildlife and Water Resources

- ⇒ Describes the natural environment at Hanscom Field including the following:
 - Wetlands delineations
 - Vernal pools
 - Wildlife habitats
- ⇒ Reports on the surface stormwater management system
- ⇒ Provides an update on the Vegetation Management Plan (VMP)
- ⇒ Presents information about Massport's National Pollution Discharge Elimination System (NPDES) permit
- ⇒ Provides figures that illustrate the current wetlands resources at Hanscom Field and the location of local water supplies
- ⇒ Identifies current and proposed use of de-icing chemicals

Chapter 10: Cultural and Historical Resources

- ⇒ Reviews the existing data on historical and archeological resources located at and near Hanscom Field
- ⇒ Presents information about the MMNHP and historical properties in the park
- ⇒ Evaluates the potential effects of traffic, air quality and noise on historical and cultural sites in the current and future planning scenarios

Chapter 11: Sustainability and Environmental Management

- ⇒ Discusses reduction in the use of toxic materials at Hanscom Field
- ⇒ Reports on Massport's sustainable design program at Hanscom Field
- ⇒ Provides information on the sustainable design approaches for new and existing facilities
- ⇒ Provides information on the EMS Program
- ⇒ Summarizes environmentally beneficial measures that are identified in previous chapters
- ⇒ Identifies, in general terms, parties responsible, costs and schedule for implementation

References and Appendices:

- ⇒ Glossary of Terms: Defines key terms, abbreviations and acronyms used in the *2017 ESPR*
- ⇒ List of Reviewers
- ⇒ Appendix A: Executive Office of Energy and Environmental Affairs Secretary's Certificate on the *2017 ESPR* Scope and a Response to Comments section
- ⇒ Appendix B: Airport Layout Plan
- ⇒ Appendix C through Appendix G: Technical appendices that provide detailed analytical data and methodological documentation for the various environmental analyses conducted for the *2017 ESPR*.

2

Facilities & Infrastructure



Hanscom Field is a Federal Aviation Administration (FAA) certified airport (per 14 CFR Part 139). It is one of three airports owned and operated by the Massachusetts Port Authority (Massport). (The other two are Boston Logan International Airport and Worcester Regional Airport.) Located about 20 miles northwest of Boston, Hanscom Field plays an important role as a corporate and General Aviation (GA) reliever to Boston Logan International Airport. Massport operates Hanscom Field as a Class 1 airport facility which serves all types of scheduled operations of air carrier aircraft (designed for more than 30 passenger seats), whose major users are a mix of corporate aviation, private pilot operations, flight schools, commuter

/commercial air services, as well as some charter and light cargo operations.

This chapter provides updated information about Hanscom's aviation facilities and infrastructure since the publication of the previous Environmental Status & Planning Report (ESPR) in 2012. The description of existing airside and landside facilities includes runways, taxiways, taxilanes, aprons, hangars, general aviation facilities, roadways, parking, and utility systems. The chapter also discusses the status of programs designed to prevent, reduce, and mitigate the occurrence of environmental impacts related to the use and storage and handling of fuel.

2.1 Key Findings Since 2012

Efforts undertaken toward improving and updating airport facilities and infrastructure at Hanscom Field since the 2012 *ESPR* are represented in Table 2-1.

Table 2-1 Key Projects Since 2012

Year	Project(s)
2012	<ul style="list-style-type: none"> ⇒ Portions of the perimeter road at the approach of Runway 11 were relocated to comply with the FAA runway safety area standards.
2013	<ul style="list-style-type: none"> ⇒ Massport rehabilitated the pavement surrounding the old T-hangars (hangars for small general aviation aircraft). ⇒ Massport relocated portions of the perimeter road at the approach of Runway 29.
2014	<ul style="list-style-type: none"> ⇒ Rectrix Aviation (referred to as Rectrix throughout the chapter) completed construction of a new Fixed Base Operator (FBO) and Hangar. This project resulted in additional parking at that location. ⇒ Massport rehabilitated the Pine Hill Apron. ⇒ Massport replaced the electrical feeds for Hangar 3.
2015	<ul style="list-style-type: none"> ⇒ Massport installed a wildlife exclusion fence near the headwaters of the Shawsheen River to prevent wildlife from entering the airfield. ⇒ Massport installed new signage and landscaping at the entrance to Hanscom Drive abutting Route 2A. ⇒ Massport rehabilitated the Runway 5 safety area beyond the runway end including a portion of Taxiway Golf and installed a new run-up area along Taxiway Golf. ⇒ Massport Fire-Rescue began operations.
2016	<ul style="list-style-type: none"> ⇒ Runway 23 safety area and a portion of Taxiway Juliet were rehabilitated. The West ramp aircraft tie-down areas were adjusted to protect Taxiway Juliet and Sierra safety areas. ⇒ Massport rehabilitated the pavement on Hanscom Drive. ⇒ A vehicle bay for the Airport Rescue and Fire Fighting (ARFF) vehicle was constructed as an addition to the Field Maintenance Garage in 2016.
2017	<ul style="list-style-type: none"> ⇒ Jet Aviation completed FBO facilities, ramp, and Hangar 17 replacement construction. This project reduced the number of parking spaces available at the Civil Air Terminal. ⇒ The first floor of the Civil Air Terminal flooded and rehabilitated. Engineering studies have been completed to improve drainage. ⇒ In August, Runway 11/29 was re-paved, repainted, and excess shoulder pavement was removed. The runway was last paved in 1994.

Year	Project(s)
2017 (continued)	<p>⇒ Boston MedFlight began construction activities to re-develop Hangar 12A. Completion of the new Leadership in Energy and Environmental Design (LEED) facility occurred in late 2018.</p> <p>⇒ T-hangar rows A-C reached the end of their useful lives and will be replaced.</p>
Source: Massport, 2018.	

2.2 Airport Facilities Inventory and Assessment

Hanscom Field has two intersecting grooved asphalt-paved runways and additional supporting infrastructure. Runway 11/29 is oriented in an east/west configuration and Runway 5/23 is oriented in a northeast/southwest configuration. Supporting infrastructure includes taxiways, an FAA-owned and operated Air Traffic Control tower (ATCT) and navigational aids (NAVAIDs), aircraft aprons, hangars, passenger terminal buildings, U.S. Customs and Border Protection (CBP), and other aviation support facilities. These facilities are described in more detail below.

2.2.1 Runways

Runway 11/29 is the primary runway and is 150 feet wide and 7,011 feet long. Both runways are equipped with an Instrument Landing System (ILS) including Distance Measuring Equipment (DME), Medium Intensity Approach Lighting System and Runway Alignment Indicator Lights (MALSR) and High Intensity Runway Lighting System (HIRL). Both runway ends have paved runway safety areas that are 200 feet wide and 1,000 feet long and are equipped with a four-light Precision Approach Path Indicator (PAPI).

Runway 5/23 is the secondary, crosswind runway. The runway is 150 feet wide, and 5,107 feet long. This runway is a non-precision instrument runway. The runway is equipped with a Medium Intensity Runway Lighting (MIRL) system and runway end identifier lights.

Beyond both runway ends are graded Runway Safety Areas (RSAs). At the approach end of Runway 23, the paved RSA is 200 feet wide and 200 feet long. At the approach end of Runway 5, the paved RSA is 200 feet wide and 645 feet long at the centerline. Both runway ends are equipped with a Visual Approach Slope Indicator (VASI).

2.2.2 Taxiways

A system of taxiways provides access between the two runways and aircraft parking aprons. Taxiway widths at Hanscom Field range from 50 to 75 feet.

All four runway ends are connected by taxiways that allow aircraft to utilize the full runway length without the need to backtaxi. Taxiways F and G provide mid- point access to the runway. Taxiway G crosses Runway 11/29 and provides direct access to Runway 23. There is a paved

run-up area on the northeast most portion of Taxiway G. Taxiway R connects the ends of Runway 11 and 23 with the north side of the airfield. Taxiway N provides mid-point access to Runway 11/29. Taxiway M connects Runway 5 and 11 to the Pine Hill T-hangars and FBO. Finally, Taxiway S is a partial parallel to Runway 5/23.

In addition to the taxiways that provide direct access to the runways, Hanscom Field has a series of taxiways that provides connectivity between these taxiways and the aircraft parking aprons. Taxiways A, B, and C provide connection to the East Ramp that is north of the U.S. Air Force (USAF) hangars, and the CBP building. Taxiway T connects Taxiway E, Taxiway J, and Taxiway S, while Taxiway J also provides access from Taxiway E to the West Ramp.

2.2.3 Air Traffic Control Facilities and Navigational Aids

The ATCT is located on the south side of the airfield east of Taxiway J. The FAA owns the ATCT, operating it daily between 7:00 AM and 11:00 PM. The tower staff directs the operations of aircraft within a five-mile radius of the airport. Air traffic controllers are responsible for controlling Hanscom Field's airspace. Close coordination is maintained between the ATCT and the FAA's Consolidated TRACON.

FAA-owned and maintained, electronic NAVAIDs serving Hanscom Field are located on and near the airport and are used to support instrument approach procedures. Runways 11 and 29 are both equipped with a Category I ILS. The ILS provides pilots with electronic guidance for aircraft alignment (horizontal), descent gradient (vertical), and aircraft position until visual contact is made with the runway. Runway 11 is also supported with a runway visual range (RVR) system consisting of a projector and receiver. The RVR provides a measurement of horizontal visibility. A Very-High-Frequency Omni-Directional Range (VOR) station, located near Laurence Massachusetts, provides a non-precision instrument approach to Runways 5 and 23 at Hanscom Field.¹⁶

The FAA manages Hanscom's airspace and provides air traffic control at Hanscom Field.¹⁷ FAA rules and regulations govern the movement of air traffic. The FAA's Consolidated Terminal Radar Approach Control (TRACON), located at Merrimack, New Hampshire, has authority and responsibility for Instrument Flight Rule (IFR) arrivals, departures, and low-altitude (above 2,500 feet) over-flights in the controlled airspace surrounding Hanscom Field. By means of remote communication between air/ground facilities, direct communication is maintained between TRACON controllers and individual pilots. The communication system is further augmented by radar coverage that enables TRACON controllers to monitor the location and movement of each aircraft.

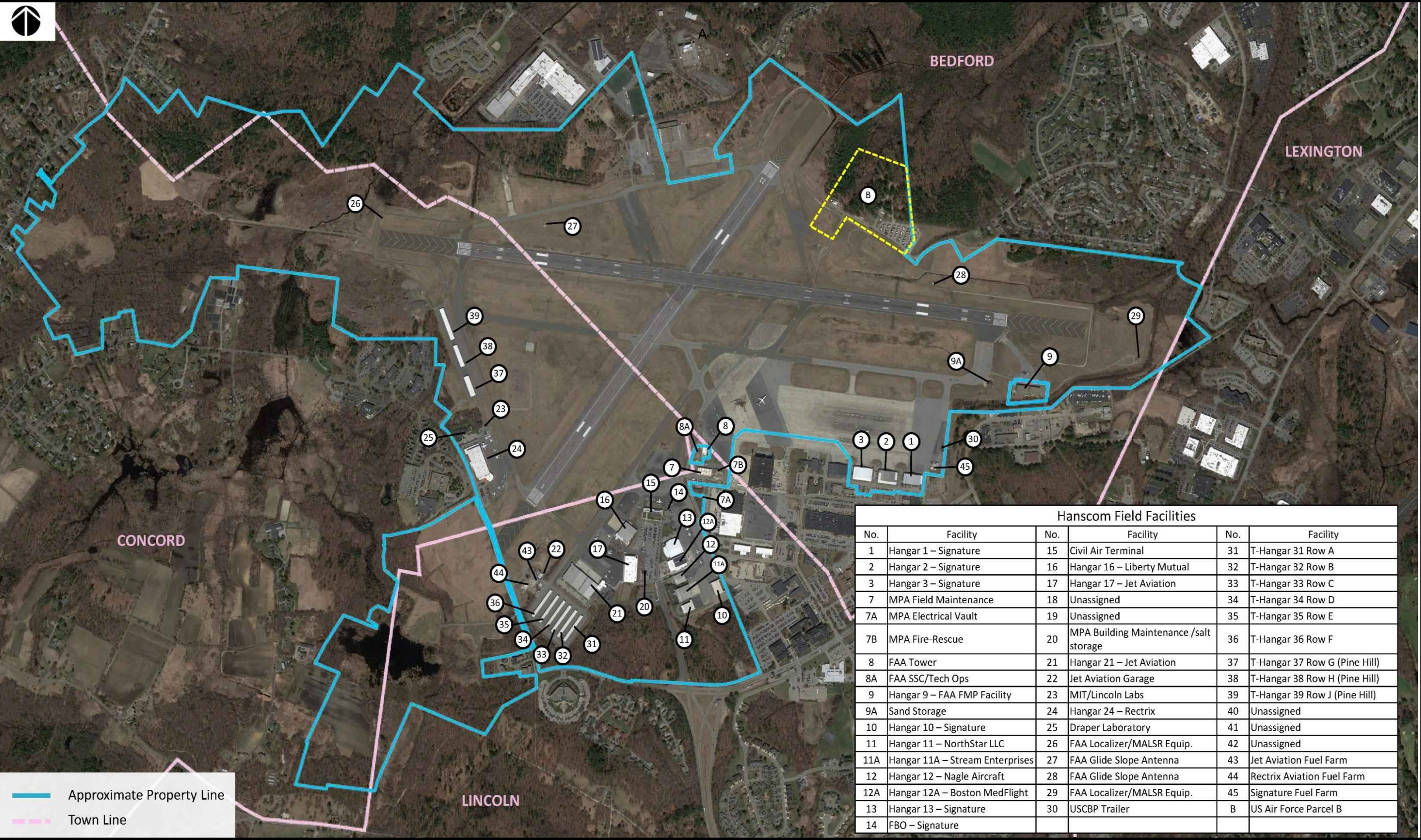
¹⁶ Airport IQ 5010: Airport Master Records and Reports. <http://www.gcr1.com/5010web/airport.cfm?Site=BED>

¹⁷ Massport. *Hanscom Field Flight Operations, FAA and Massport Responsibilities*. <http://www.massport.com/hanscom-field/about-hanscom/airport-activity-monitor/flight-operations/>.

2.2.4 Buildings and Hangars

Most existing facilities at Hanscom Field are considered to be in good condition. Some of the older buildings lack amenities. Table 2-2 provides a summary of existing building size and condition (i.e., excellent, good, fair, or poor). Figure 2-1 serves as a reference guide to the facilities listed in Table 2-2 and illustrates the location of leased and Massport owned properties. One parcel of land in the North Airfield Area, consisting of area above and below Hartwell Road, was returned to Massport control in 2011. The available vehicle parking for these facilities is presented in this chapter in Table 2-3.

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Source: Massport, Google Earth April 2018

Figure 2-1 Hanscom Field Facilities



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Table 2-2 Hanscom Field Facilities and Infrastructure Inventory and Assessment

GLP ¹ No.	Facility	Primary User	Total S.F. ² Footprint	Year Built	Condition ⁴	Facility Type/ Comments
1	Hangar 1	Signature Flight Support	28,400	1955	Good	Fixed Base Operator
2	Hangar 2	Signature Flight Support	36,000	1955	Good	Fixed Base Operator
3	Hangar 3	Signature Flight Support	36,000	1955	Good	Fixed Base Operator
7	Field Maintenance	Massport	11,300	1984	Good	Airfield Maintenance
7A	Electrical Vault	Massport	1,000	n/a	Good	
7B	Fire-Rescue Quarters	Massport	900	2016	Excellent	
8	Air Traffic Control Tower	FAA-owned property	5,200	2002	n/a	FAA Control Tower
8A	FAA SSC/ Tech Ops	FAA-owned property	1,800	n/a	n/a	
9	FMP Facility	FAA-owned property	21,000	n/a	n/a	Field Maintenance Program Storage
9A	Sand Storage	Massport	2,400	2005	Good	Airfield Sand Storage
10	Hangar 10	Signature Flight Support	20,600	1950s	Good	Fixed Base Operator
11	Hangar 11	NorthStar	15,600	1969	Good	Corporate/ Conventional GA Hangar
11A	Hangar 11A	Stream Enterprises	26,700	2001	n/a	Corporate/ Conventional GA Hangar
12	Hangar 12	Nagle Aircraft	14,500	2002	n/a	Aircraft Maintenance Facility
12A	Hangar 12A	Boston MedFlight	30,000	2017/ 2018	n/a	Medical Flights and training
13	Hangar 13	Signature Flight Support	40,000	2001	n/a	Fixed Base Operator

GLP ¹ No.	Facility	Primary User	Total S.F. ² Footprint	Year Built	Condition ⁴	Facility Type/ Comments
14	FBO Facility	Signature Flight Support	6,500	1988	n/a	Fixed Base Operator
15	Civil Air Terminal Building	Massport	12,700	1953	Fair	Passenger Terminal and Aviation Support
16	Hangar 16	Liberty Mutual	37,300	2005	n/a	Corporate/Conventional GA Hangar
17	Hangar 17	Jet Aviation	45,900	2017	n/a	Fixed Base Operator
20	Maintenance Building	Massport	2,100	1954	Poor	Building Maintenance and salt storage
21	Hangar 21	Jet Aviation	84,700	2001, 2017	n/a	Fixed Base Operator
22	Garage	Jet Aviation	2,800	1985	n/a	Fixed Base Operator
23	MIT/Lincoln Labs	Lincoln Laboratory	4,500	n/a	n/a	Leased from Massport
24	Hangar 24	Rectrix Aviation	89,714	2014	n/a	
25	Draper Laboratory	Draper Laboratory	13,100	1948	n/a	
26	FAA Localizer	FAA	n/a	n/a	n/a	
27	FAA Glide Slope	FAA	n/a	n/a	n/a	
28	FAA Glide Slope	FAA	n/a	n/a	n/a	
29	FAA Localizer	FAA	n/a	n/a	n/a	
30	USCBP	U.S. Customs and Border Protection	1,900	n/a	n/a	
31	T-Hangar Row A	Massport	13,700	1972	Good	Reached end of useful life, will be replaced

GLP ¹ No.	Facility	Primary User	Total S.F. ² Footprint	Year Built	Condition ⁴	Facility Type/ Comments
32	T-Hangar Row B	Massport	14,200	1973	Good	Reached end of useful life, will be replaced
33	T-Hangar Row C	Massport	14,300	1973	Good	Reached end of useful life, will be replaced
34	T-Hangar Row D	Massport	13,900	1982	Good	
35	T-Hangar Row E	Massport	13,900	1982	Good	
36	T-Hangar Row F	Massport	13,900	1982	Good	
37	T-Hangar Row G	Massport	16,500	1987	Good	New roof coating in 2011
38	T-Hangar Row H	Massport	14,500	1987	Good	New roof coating in 2011
39	T-Hangar Row J	Massport	21,200	1987	Good	New roof coating in 2011
43	FBO Fuel Farm	Jet Aviation	2,400	2008	n/a	Fixed Base Operator
44	FBO Fuel Farm	Rectrix Aviation	2,300	2014	n/a	Fixed Base Operator
45	FBO Fuel Farm	Signature Flight Support	3,300	1976	n/a	Fixed Base Operator
B	USAF Parcel B	U.S. Air Force	n/a	n/a	n/a	Leased from Massport by the U.S. Air Force
Notes: 1. L.G. Hanscom Field 2017 General Location Plan (GLP). Does not include USAF or U.S. Navy facilities, except properties leased from Massport. 2. Building footprints determined from airport drawing provided by Massport 3. Not applicable (n/a) applies to unused Building ID or facilities where information was not available 4. Property condition determined from HNTB FY 2018 Massport Facilities Annual Report of Conditions						

2.2.5 Full-service Fixed Base Operator Facilities

A full-service Fixed Base Operator (FBO) is a company that handles a range of needs for based and transient aircraft, their operators, and their passengers. Services may include cleaning, maintaining, fueling and parking, hangaring, flight planning for pilots, and arranging for the specific needs of passengers and flight crews, (such as ground transportation or overnight accommodations). Although the majority of FBO activity involves servicing corporate GA aircraft activity, the FBOs also serve some charter activity. The majority of flights depart between 7:00 and 9:00 AM and return the same day between 3:00 and 7:00 PM on weekdays. Saturday is typically the lightest day of the week. Occasionally, activity resumes Sunday afternoon with departures in support of the following workweek.

Hanscom Field currently has three full-service FBOs: Jet Aviation, Signature Flight Support, and Rectrix. These FBOs typically operate 24/7.

Jet Aviation operates approximately 130,000 square feet of hangar space and a 6,000-square-foot FBO on the West Ramp. Its new, replacement hangar opened in June 2017 and can accommodate aircraft up to the Global 7000 or G650. The adjacent 92,000-square-foot ramp was also upgraded in 2017. Jet Aviation also operates a fuel farm nearby.

Signature Flight Support operates an FBO facility on the West Ramp, directly east of the Civil Air Terminal. South of this FBO facility, Signature leases a primary, 38,000-square-foot hangar (Hangar 13). The hangar was constructed by the Mercury Air Group in 2001. In addition to its primary hangar, Signature leases Hangar 10 (20,000 square feet), Hangar 1 (28,000 square feet), and Hangars 2 and 3 (36,000 square feet each). The buildings are primarily used for aircraft maintenance and storage with some area available for general office activities. Signature also operates a fuel farm on the East Ramp.

Rectrix is the newest FBO at Hanscom Field. It opened in 2014. Rectrix is located on the southwest side of the airfield, west of Taxiway M. Facilities include a 60,000-square-foot hangar and a 20,000-square-foot guest and office space. Rectrix operates a fuel farm located west of the Jet Aviation Fuel Farm.

All three FBOs report to be sold out, with waiting lists for corporate jet customers at each.

2.2.6 Maintenance Facilities

An aircraft maintenance facility provides service and repairs to aircraft including engines, flight instruments, interiors, and structural components. These services are provided on both a scheduled and as-needed basis to locally-based and transient aircraft. All of the above-mentioned FBOs at Hanscom Field provide aircraft maintenance, as does Nagle Aircraft Services (some of the maintenance services are outsourced through aviation maintenance companies). Nagle Aircraft Services operates a 14,300-square-foot hangar (Hangar 12), on the east side of the West Ramp.

2.2.7 Corporate/Conventional Hangars

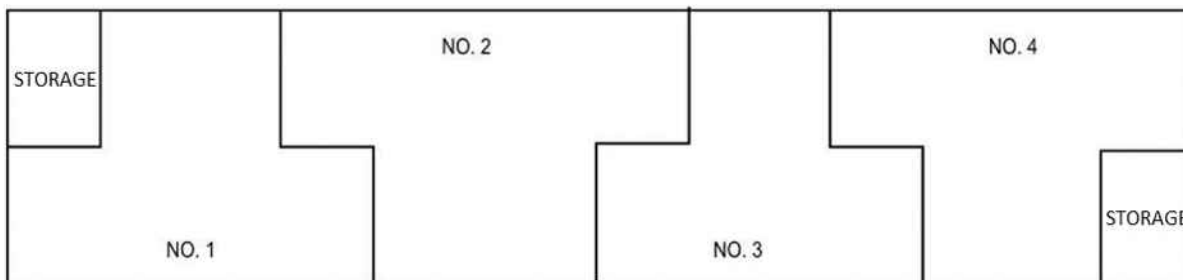
Corporate and conventional hangars are generally large, open span hangars for storage of one or multiple aircraft. Corporate hangars at Hanscom Field are designed to accommodate turbo prop or jet aircraft that are used for business or commercial operations.

Active corporate and conventional hangars at Hanscom Field include a 15,608-square-foot Hangar 11 (Northstar LLC) and a 26,250-square-foot Hangar 11A (Stream Enterprises), both located on the east side of the West Ramp, and a 37,800-square-foot Hangar 16 (Liberty Mutual) on the west side of the West Ramp. These hangars are used by corporate entities to support their flight departments or businesses. Most corporate hangars include office or storage space to accommodate the needs of those entities that are using the hangar.

2.2.8 T-Hangars

T-hangars are smaller than corporate and conventional hangars and offer private storage for GA aircraft. The name refers to the shape of each unit, which affords the most efficient space storage for small, individual aircraft. Figure 2-2 displays a typical T-Hangar layout (areas labeled storage space can also be office space). Six T-hangar buildings with 12 individual T-hangar units each are located in the southwest portion of the West Ramp. These are commonly referred to as the "South T Hangars." Each individual hangar unit contains approximately 1,344 square feet of space and can accommodate one small aircraft.

Figure 2-2 Standard T-Hangar Layout



On the southwest side of the airfield in the Pine Hill Area, there are three T-hangar buildings (Hangars 37, 38, and 39), commonly referred to as the "Pine Hill Ts." These were constructed in 1987. One building has 18 units and the second has 12 units. Each unit in these buildings is 1,312 square feet and can accommodate a single-engine aircraft. The third building has eight 1,886-square-foot units. The larger units can accommodate light to medium twin-engine aircraft.

In 2016 sections of the landside roadways and T-hangars that were damaged during the winter of 2014-2015 were repaired. In 2017 T-Hangar Rows A-C have reached the end of their useful life and are being replaced. Re-construction is expected to be completed in summer of 2019.

2.2.9 Flight Schools

Flight schools provide flight training to individuals learning to fly aircraft. Training is provided in classroom facilities as well as in an aircraft with a certified instructor. Currently, two flight schools at Hanscom Field operate out of the Civil Air Terminal: East Coast Aero Club and Mike Gouliau Aviation. A longtime flight school, Executive Flyers Aviation, closed its Hanscom Field location. The flight schools use the tie-down facilities (areas on an airport specifically designed for the outdoor storage of aircraft) on the East and West Ramps for aircraft parking and storage.

2.2.10 Commuter Services

Commuter service is not currently offered from Hanscom Field. The previous operator, Streamline Air, which commenced operations on April 4, 2011, suspended service on September 15, 2012. Various companies operate on-demand air taxi and charter service at Hanscom Field.

2.3 Other Aviation-Related and Ancillary Businesses Inventory

In addition to the services referenced above, there are varieties of mostly aviation-related businesses that operate out of offices located in the Civil Air Terminal or the FBOs, such as Boston MedFlight, car rental agencies, and food services. Hangar 12A was occupied and used by the National Aviation Academy as an aircraft mechanic training school until the lease expired in 2015. In 2016 Massport accepted a proposal from Boston MedFlight to redevelop the site. The new facility is multi-purpose facility incorporating hangar space, office space and training space. Boston MedFlight completed its new facility in 2018.

2.3.1 Civil Air Terminal

The three-story Civil Air Terminal building has a total gross floor area of approximately 36,000 square feet, consisting of space for passenger holding areas, public seating, general office space, flight schools, rental agencies, and Massport administrative offices.

In 2017, Massport moved all administrative offices to the vacant office space on the 2nd floor of the Civil Air Terminal, consolidating resources and utilizing a smaller footprint. In July 2017, a rain storm flooded the building with 30 inches of water in under half hour. As a result, first floor tenants were temporarily relocated and a full rehabilitation of the first-floor facility was undertaken. Massport has also allocated capital funding to improve the building's drainage system.

2.3.2 Aircraft Parking Areas

Aircraft that are not kept inside hangars are parked on apron areas. Aprons are open, paved spaces that provide no shelter from the elements. Small aircraft are tied down with anchors provided for securing aircraft.

Spaces for aircraft parking are located at the East Ramp, and the West Ramp. The West Ramp includes areas to the east, west, and north of the Civil Air Terminal. The East Ramp abuts the Hanscom AFB. This ramp is comprised of approximately two million sf of gross apron space. Approximately 350,000 square feet are used for aircraft tie-downs. The remainder is currently used for taxiway access and other transient aircraft parking for civilian and military aircraft.

2.3.3 Fire Fighting and Police

has been standardizing Airport Rescue and Fire Fighting (ARFF) procedures across all three Massport-owned airports in order to enhance safety and coordination efforts. This allows Massport Fire-Rescue to leverage additional resources from other Massport facilities (airports) for use at Hanscom Field. Massport Fire-Rescue began operations in 2015 with a temporary ARFF vehicle bay added to the maintenance garage. Construction on a permanent facility began in 2018 and it is expected to be completed by 2019. This requires removal of approximately 17 aircraft tie downs that currently exist at the site. The aircraft tie downs will be absorbed by FBOs at Hanscom Field.

The Massachusetts State Police is located inside the Civil Air Terminal and provides policing and law enforcement services to Hanscom Field.

2.3.4 Miscellaneous Terminal Support Facilities

Additional terminal and general airport support facilities exist at Hanscom Field, including fuel storage and airfield maintenance facilities. The three FBOs store and dispense fuel for civil and military aircraft. The Jet Aviation and Rectrix fuel farm facilities are located on the southwest side of the airfield, near the old T-hangars. The Signature fuel farm facility is located on the east side, adjacent to Hangar 1. Massport maintenance vehicles, including trucks, snowplows, construction equipment, and other general maintenance equipment are stored adjacent to or inside an 11,300-square-foot Airfield Maintenance Building located adjacent to the FAA Air Traffic Control Tower.

2.4 Infrastructure Inventory and Assessment

Hanscom Field is served by an infrastructure system of transportation and utility facilities. Roadway conditions are described generally below, with more detail provided in Chapter 6 Ground Transportation. In the *2012 ESPR*, a detailed inventory of parking areas was conducted to describe the number and location of spaces. Updates provided by site personnel have been

used to prepare the 2017 *ESPR*. Information regarding the water distribution system's supply and demand and the wastewater system serving Hanscom Field is based upon information in the 1995 *GEIR*, the 2012 *ESPR*, plus updates provided by Massport. Information regarding the stormwater management and drainage system is based on the 1995 *GEIR*, 2000 *ESPR*, 2005 *ESPR*, 2012 *ESPR*, the Stormwater Pollution Prevention Plan (SWPPP) and updates to the SWPPP supplied by Massport.

2.4.1 Surface Access Roadways and Ground Transportation

Hanscom Drive provides the primary access to the Massport facilities on Hanscom Field. Hanscom Drive intersects with Route 2A, which in turn provides connections to Route 128/I-95. These designated state and federal highways form the main surface transportation connections to points north, east, and south of the airport. Route 2A also provides connections to Route 2 origins and destinations to the west. Old Bedford Road, which intersects with Hanscom Drive at the entrance to Hanscom Field and Virginia Road, provides connection to Routes 62, 4, and 225.

Hanscom Drive is a paved, four-lane divided roadway from Route 2A that provides access to Hanscom Field and the Hanscom AFB. After crossing Old Bedford Road, Hanscom Drive becomes an undivided two-lane roadway providing access to the Civil Air Terminal, the main parking lot, and other facilities on the West Ramp of the airport.

Hanscom Drive feeds into a two-lane roadway around the perimeter of the main lot. The roadway is one-way in front of the Civil Air Terminal with designated areas for passenger drop-off and pick-up, taxis, and bus stops. This roadway is in good condition, and the capacity of the roadway is adequate to meet its internal circulation needs.

Ground transportation to Hanscom Field is provided by the Massachusetts Bay Transportation Authority (MBTA). The Routes 62 and 76 buses stop in front of the Civil Air Terminal and provide connection to Lexington, Arlington, Bedford and the MBTA Red Line train in Cambridge. From the Red Line, commuters can continue anywhere within the MBTA transit system. Currently the 62 bus stops at Hanscom Field on Saturdays only.

The Airport is easily accessible by bike and has convenient cycling access via the Minuteman Bikeway and other bike paths. Bike racks are available at multiple locations throughout the Airport, including the Civil Air Terminal.

2.4.2 Automobile Parking

There are approximately 1,380 automobile parking spaces at Hanscom Field (excluding USAF Parcel B). This includes both marked and unmarked spaces around the Civil Air Terminal, aircraft hangars, and other facilities on airport property. Parking spaces were counted through visual inspection and recent satellite imagery.

Table 2-3 summarizes available parking by facility. The 2017 *ESPR* inventory represents an approximate 14 percent decrease over the results that were reported in the 2012 *ESPR* (excluding USAF Parcel B). The drop is mostly due to the relocation of Hangar 17, which displaced parking spaces from the lot in front of the Civil Air Terminal. Some of these spaces were recovered by the construction of a new lot off Hanscom Drive, by the airport entrance, but the net capacity decreased.

Additional automobile parking may be available in the future, as described in the recent Environmental Assessment¹⁸ in the North Airfield Area (property that was formerly leased from Massport by the USAF).

Table 2-3 Summary of Vehicular Parking Spaces

GLP No. ³	Facility	Primary User	Number of Parking Spaces			Comments
			2005	2012	2017	
1	Hangar 1	Signature Flight Support	37	37	37*	
2	Hangar 2	Signature Flight Support	20	20	22*	
3	Hangar 3	Signature Flight Support	22	20	20*	
7	Field Maintenance	Massport	18	18	18*	
7A	Electrical Vault		n/a	n/a	n/a	
7B	Fire-Rescue Quarters		n/a	n/a	4	
8	Air Traffic Control Tower	FAA-owned property	107	107	105*	
8A	FAA SSC/ Tech Ops	FAA-owned property	n/a	n/a	n/a	
9	FMP Facility	FAA-owned property	n/a	18	18*	
9A	Sand Storage	Massport	0	0	0*	

¹⁸ Massport, "Environmental Assessment for L.G. Hanscom Field Aviation Facility Improvements Project". September, 2018.
<http://www.massport.com/media/2970/hanscom-final-ea-facility-improvements-9-26-18.pdf>

GLP No. ³	Facility	Primary User	Number of Parking Spaces			Comments
			2005	2012	2017	
10	Hangar 10	Signature Flight Support	64	64	37	
11	Hangar 11	NorthStar	34	34	11	
11A	Hangar 11A	Stream Enterprises	25	25	18	
12	Hangar 12	Nagle Aircraft	12	12	12	
12A	Hangar 12A	Boston MedFlight	57	57	34	Under construction
13	Hangar 13	Signature Flight Support	15	15	14	
14	FBO Facility	Signature Flight Support	10	10	10	
15	Civil Air Terminal Building	Massport	667	667	444	
16	Hangar 16	Liberty Mutual	45	45	46	
17	Hangar 17	Jet Aviation	25	25	31	
18	Unassigned	n/a	n/a	n/a	n/a	
19	Unassigned	n/a	n/a	n/a	n/a	
20	Maintenance Building	Massport	23	23	0	
21	Hangar 21	Jet Aviation	142	142	178	
22	Garage	Jet Aviation	0	0	0	
23	Draper Lab	Draper Laboratory	17	17	17*	
24	Hangar 24	Rectrix Aviation	42	70	97	
25	MIT/Lincoln Labs	Lincoln Laboratory	26	26	26*	
26	FAA Localizer	n/a	n/a	n/a	n/a	

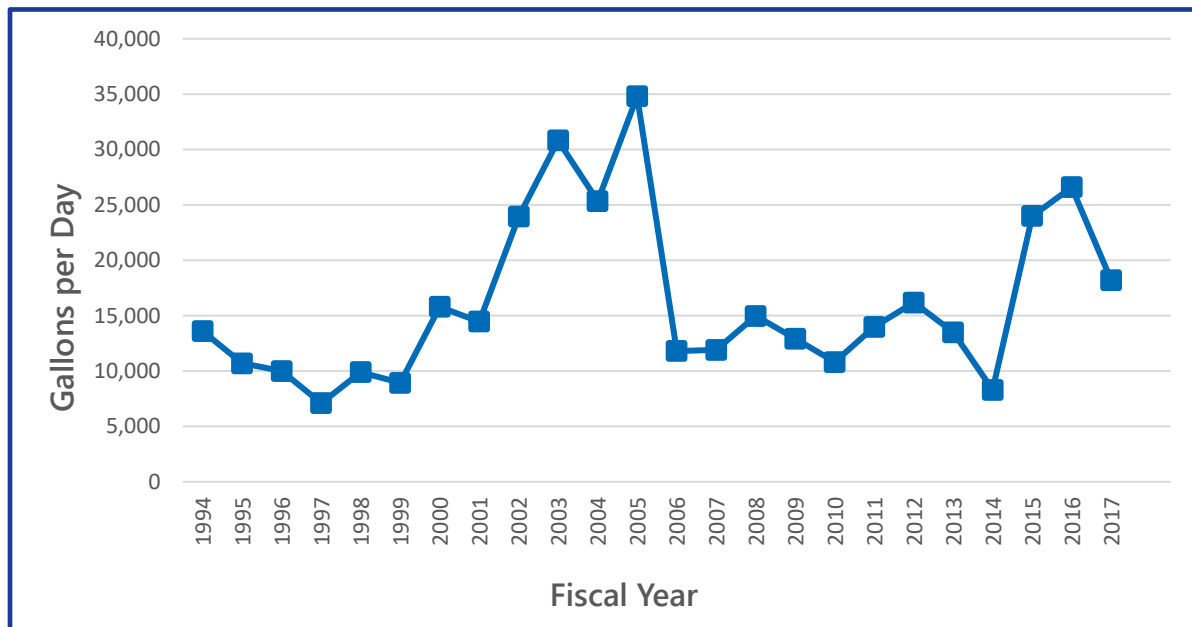
GLP No. ³	Facility	Primary User	Number of Parking Spaces			Comments
			2005	2012	2017	
27	FAA Glide Slope	n/a	n/a	n/a	n/a	
28	FAA Glide Slope	n/a	n/a	n/a	n/a	
29	FAA Localizer	n/a	n/a	n/a	n/a	
30	USCBP	U.S. Customs and Border Protection	5	5	5*	
31	T-Hangar Row A	Massport	12	12	12	Based on aircraft occupancy
32	T-Hangar Row B	Massport	12	12	12	Based on aircraft occupancy
33	T-Hangar Row C	Massport	12	12	12	Based on aircraft occupancy
34	T-Hangar Row D	Massport	12	12	12	Based on aircraft occupancy
35	T-Hangar Row E	Massport	12	12	12	Based on aircraft occupancy
36	T-Hangar Row F	Massport	12	12	12	Based on aircraft occupancy
37	T-Hangar Row G	Massport	8	8	8	Based on aircraft occupancy
38	T-Hangar Row H	Massport	12	12	12	Based on aircraft occupancy
39	T-Hangar Row J	Massport	18	18	18	Based on aircraft occupancy
40	Unassigned	n/a	n/a	n/a	n/a	
41	Unassigned	n/a	n/a	n/a	n/a	
42	Unassigned	n/a	n/a	n/a	n/a	
43	FBO Fuel Farm	Jet Aviation	n/a	n/a	n/a	
44	FBO Fuel Farm	Rectrix Aviation	n/a	n/a	n/a	

GLP No. ³	Facility	Primary User	Number of Parking Spaces			Comments
			2005	2012	2017	
45	FBO Fuel Farm	Signature Flight Support	n/a	n/a	n/a	
-	Jet Aviation Lot	n/a	n/a	n/a	71*	Located off Hanscom Drive, near entrance
Total			1,523	1,567	1,351	
Notes: 1. L.G. Hanscom Field 2017 General Location Plan (GLP). Does not include USAF or U.S. Navy facilities, except properties leased from Massport. 2. Not applicable (n/a) applies to unused Building ID or facilities where information was not available. * Parking space count based on satellite imagery (Google Earth, April, 2017)						

2.4.3 Water Supply and Demand

A 24-year history of water usage from 1994 to 2017 is provided in Figure 2-3. Water meter readings from 1994 through 2012 are based upon the 2012 *ESPR*. Data from 2016 includes only USAF Main. Data from 2013 are based upon information from Massport; data from May 2013 was not available. Water usage for fiscal years 2014 through 2016 do not include data from August in any year due to unavailability. Figure 2-4 shows the Massport water distribution system.

Figure 2-3 History of Water Usage from 1993 to 2017



Source: Massport, 2018

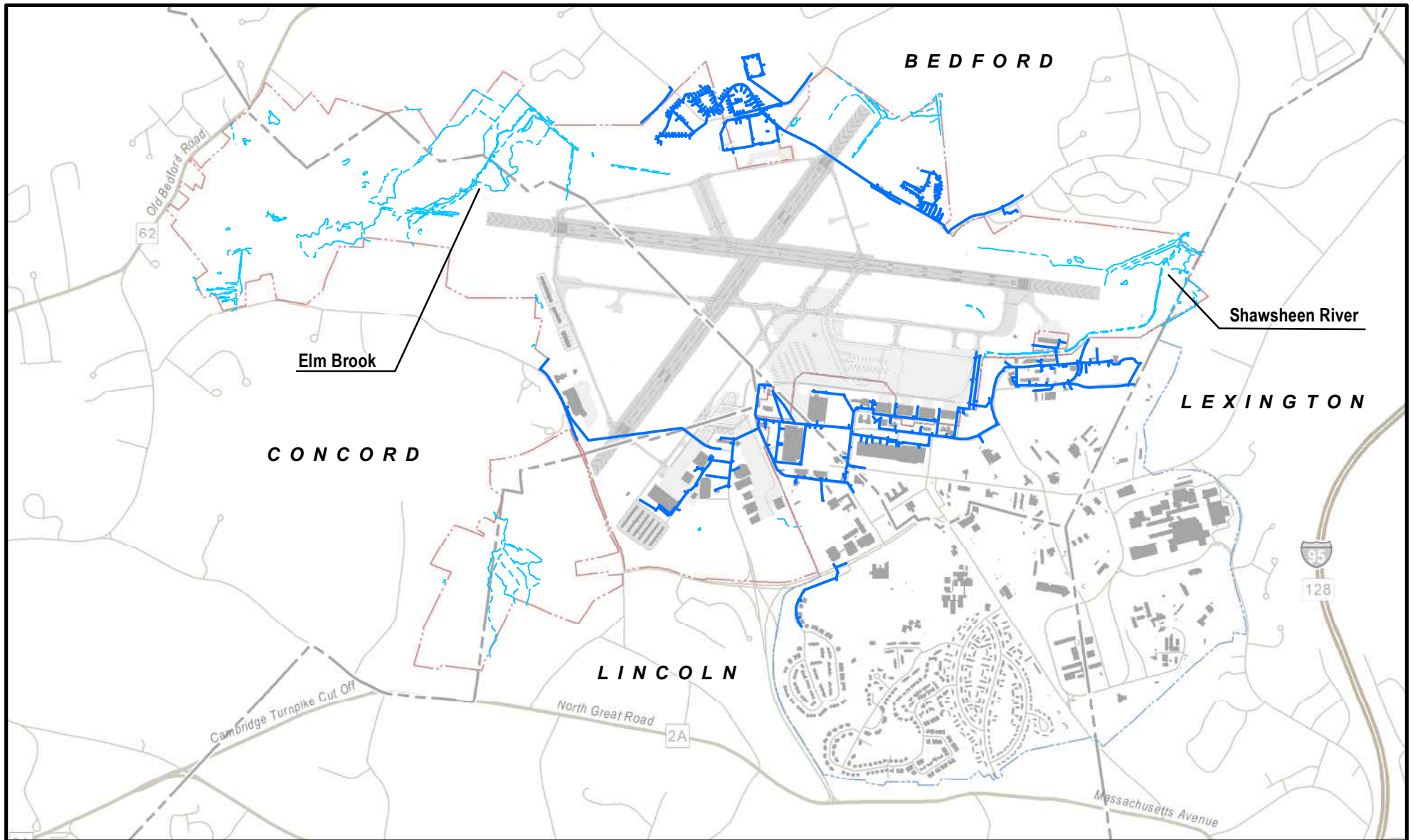
Massport's water supply is provided primarily by the adjacent Hanscom AFB water distribution system. Hanscom AFB purchases its water from the towns of Lexington and Bedford, Massachusetts. Lexington is supplied by the Massachusetts Water Resources Authority (MWRA). Bedford also receives most of its water from the MWRA and a small amount from the Shawsheen Groundwater Treatment Facility.¹⁹ The MWRA water comes from the Quabbin Reservoir, about 65 miles west of Boston, and the Wachusett Reservoir, 35 miles west of Boston. Both reservoirs are protected naturally and by both the MWRA and the Massachusetts Department of Conservation and Recreation (DCR). MWRA's licensed treatment operators provide state-of-the-art treatment to the drinking water.

Hanscom AFB has one interconnection with Bedford that is used to supply the FamCamp. Bedford has its own groundwater supply and it purchases surface water from Lexington. In 2017, the entire system was supplied with 180 million gallons of water. Approximately 97 percent of this water supply came from the MWRA, while the remaining amount came from the Shawsheen Groundwater Treatment Facility.

The Massport water mains vary in size (6, 8, or 12 inches in diameter) and composition (cast iron, ductile iron, asbestos cement, and polyvinyl chloride).

¹⁹ Hanscom Air Force Base. June 21, 2018. *2017 Annual Drinking Water Quality Report*. <https://www.hanscom.af.mil/News/Article-Display/Article/1556619/2017-annual-drinking-water-quality-report/>

The Massport water distribution system primarily serves the West Ramp and the East Ramp Area. The Hanscom AFB system can provide a maximum flow rate of 1,500 gallons per minute (gpm) at 20 pounds per square inch (psi) at the master meter that supplies the West Ramp. Each of the hangars on the East Ramp have their own separate connection to the Hanscom AFB system. The Hanscom AFB system includes approximately 22 hydrants for firefighting purposes. Twenty of these hydrants are fed from the USAF water distribution system and two are fed from the Town of Concord. These hydrants are all located strategically near the major buildings and hangars. The fire flow assessment for each area is described in Table 2-4.



- Massport Property within MMNHP Congressional Boundary
- Existing Water Line
- Hydrology
- Hanscom AFB Property Boundary
- Municipal Boundary
- Interstate
- Highway
- Road



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Existing Water System

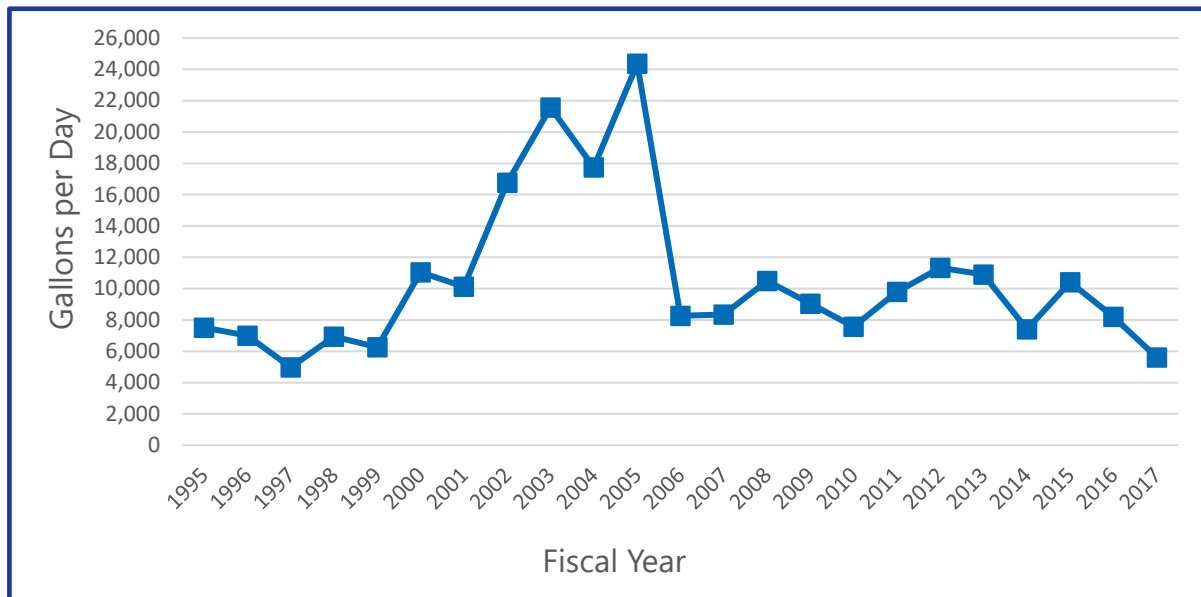
Table 2-4 Existing System Fire Flow Modeling

Area/Facility	Available Fire Flow at 20 psi (gpm)
West Ramp	
Civil Air Terminal	1,410
Hangar 11	1,160
Hangars 1 & 3	1,230
Hangar 10	1,020
Hangar 12A	n/a
Hangar 2	1,150
Old T-Hangars	990
MPA Maintenance Buildings	1,460
Pine Hill Area	1,500
East Ramp Area	2,000
Hangars 1, 2, and 3	2,000
FAA Storage Facility	n/a
Source: Massport	

2.4.4 Sanitary Sewer System

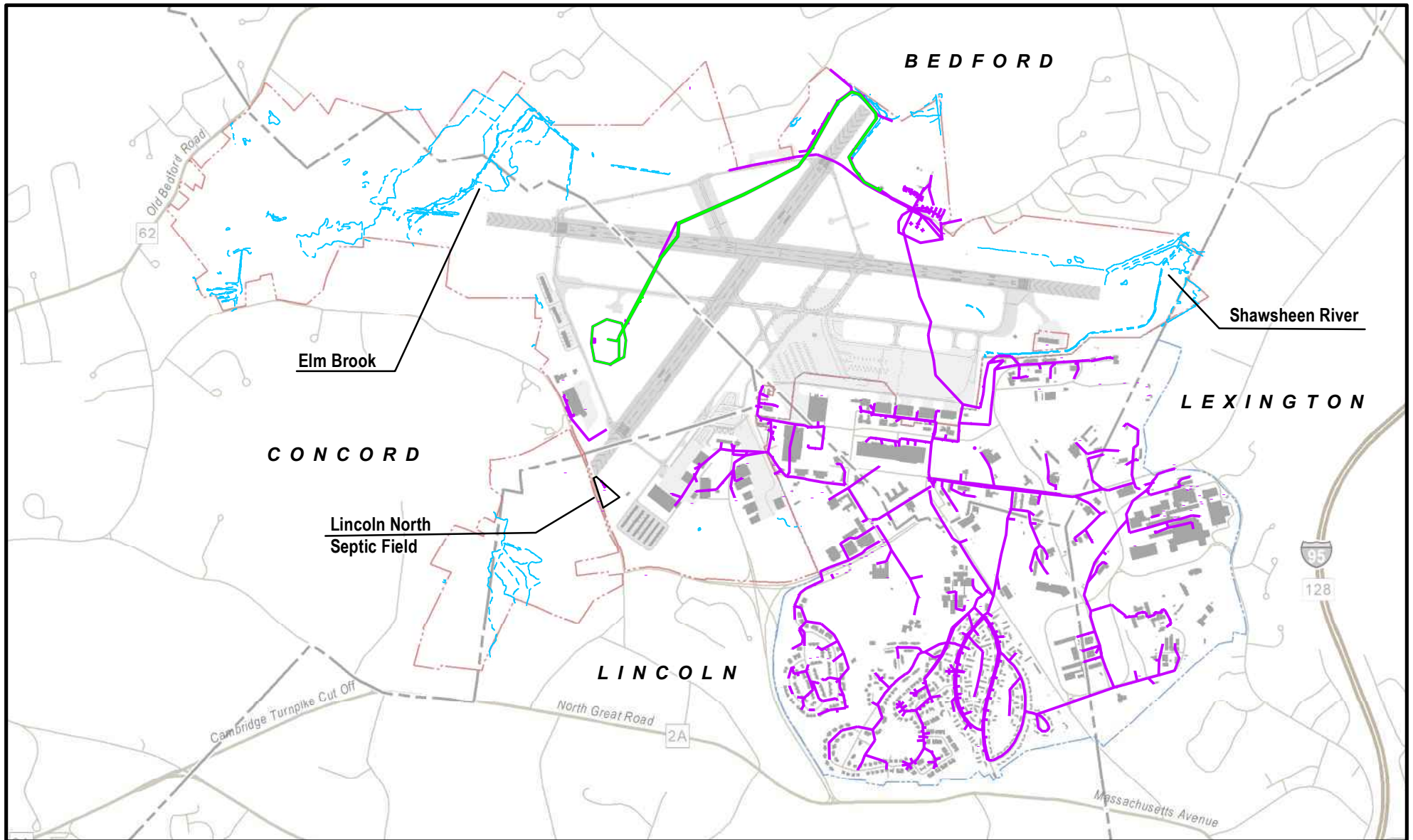
Figure 2-5 provides average daily wastewater flows at Hanscom Field. Figure 2-6 shows Massport's existing sewer system, the location of the septic system serving Lincoln North, which is sited on Massport land west of the West Ramp, and the septic system used in the Pine Hill Area. The Rectrix sewer system is connected to the West Ramp.

Figure 2-5 Daily Average Wastewater Flows



Notes: Flows south to the Massachusetts Water Resources Authority System. Wastewater leaving the site is estimated to be 70 percent of water usage (see Figure 2-3). This reflects some on-site septic systems that do not tie into the MWRA. Data for some individual months between 2013 and 2016 are unavailable as utility bills often aggregate multiple months of usage. Specifically, May 2013 data was unavailable and thus not included. Years 2014 through 2016 do not include data for August.

Source: Massport



- | | | | |
|--|---|--|-----------------------|
| | Massport Property within MMNHP Congressional Boundary | | Existing Water Line |
| | Hanscom AFB Property Boundary | | Hydrology |
| | Municipal Boundary | | Existing Sewer |
| | Interstate | | USAF Treatment System |
| | Highway | | |
| | Road | | |



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Existing Sanitary Sewer System

Massport's wastewater is pumped to the Town of Bedford's force main and then into the Town of Lexington's force main. The USAF has two pump, or lift, stations on base: the lower lift station at Building 1539 and the upper lift station at Building 1306. The lower lift station was last upgraded in 2011 and has three 40-horsepower (HP) pumps. That station has a total capacity of 900 gpm and serves Massport's Hanscom Field facilities and Hanscom AFB housing. The upper station receives flow from the lower pump station as well as the Officers Club and Lincoln Laboratory. The upper station was upgraded in 2005-2006. It is equipped with two 50 HP pumps, and one 125 pump, and two wet wells with a combined storage capacity of 240,000 gallons.

The flow from the upper station is pumped to a 10-inch force main that discharges wastewater to a force main along Hartwell Avenue. This main connects to a 20-inch force main from the Town of Bedford near the intersection of Hartwell Avenue and Bedford Street. The capacity of the force main leaving the Hanscom AFB is 1,725 gpm but use is limited to 1,500 gpm in keeping with the USAF's agreement with the Town of Bedford and the MWRA.

Massport's wastewater system was initially constructed in the 1950s. The system underwent expansion in the 1970s and 1980s to service new facilities. It was upgraded in 1994 on the West Ramp. The upgraded pipe network, along with upgrades to the manholes in the same area, eliminated a problem of infiltration and inflow. According to the "Water System Improvements Study," the on-site 6-inch and 8-inch vitrified clay pipes have capacities of 230,000 gpd and 500,000 gpd respectively.²⁰ Neither is currently near full capacity. Additionally, the Supplement to Site Development Plan and Design Guidelines by Greiner Engineering Services, Inc. (1987) states, prior to the lower pumping station on the Hanscom AFB, the system expands from an 8-inch to a 12-inch line with a capacity of 1,045,000 gpd.

2.4.5 Stormwater Management and Drainage System

Hanscom Field is located in the Shawsheen River Basin. Runoff from Massport property and the USAF property is conveyed by open channels and a closed storm drainage system. The system discharges directly and indirectly into the Shawsheen River to the east, Elm Brook (a tributary to the Shawsheen) to the west, and wetlands to the north of the site. Most of the soil types on Hanscom Field are classified as Hydrologic Soils Group C. This soil type is characterized by a slow rate of infiltration after the soils have become saturated during long duration storm events and high groundwater levels.

Hanscom Field employs an extensive drainage system that was designed and constructed in the early 1950s when the USAF enlarged and improved the airfield. The system was expanded and modified over the ensuing years to serve the additional development. The storm drainage system consists of a series of catch basins placed along most of the edges of the runways, taxiways, and apron areas. The stormwater system's original design, containing pervious bottom catch basins and perforated/open jointed pipes, was intended to drain groundwater

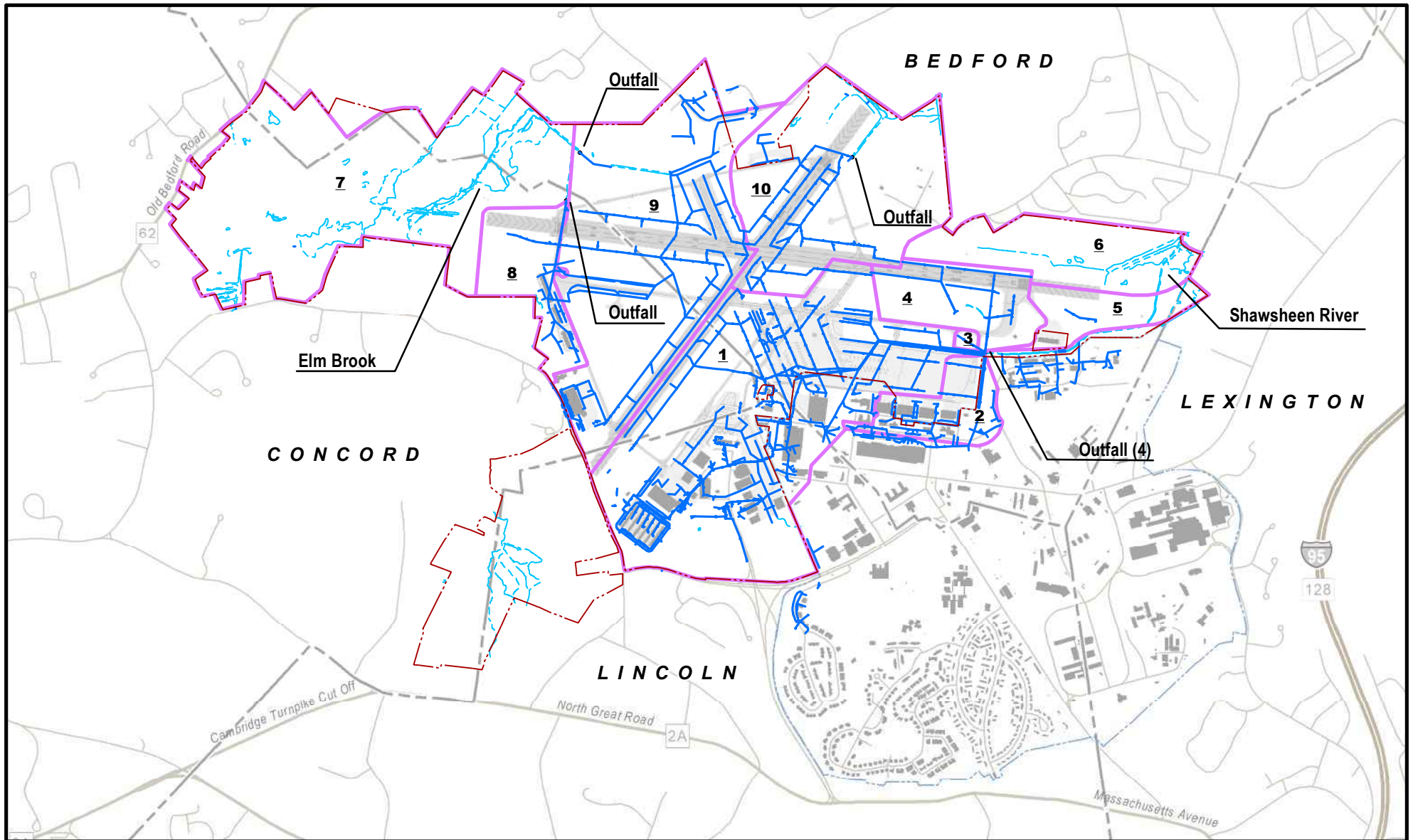
²⁰ Metcalf & Eddy. 1992. *Water System Improvements Study*.

as well as convey surface water away from the airfield's paved surface and infield areas. The collection system conveys stormwater and groundwater to eight outfall locations and two overland flow areas that in turn discharge directly or indirectly into the Shawsheen River.

Massport has been working cooperatively with the Massachusetts Department of Environmental Protection (MassDEP) and the USAF to improve the flow characteristics and profile of stormwater discharges into the Shawsheen River. Massport continues to remove pavement to decrease impermeable areas on the airfield and has incorporated water quality and water quantity improvements into ongoing projects using Low Impact Development (LID) technologies. Massport has also taken measures to control stormwater discharges into the river directly.

Massport and the USAF continued joint discussions with MassDEP regarding the Shawsheen Watershed Initiative. In 2011, Massport received internal approval to proceed with a plan for future improvements to the Shawsheen River headwaters, to be completed jointly by Massport and the USAF. With approval from MassDEP, Massport developed a new, more comprehensive computer model to assess how various stormwater recharge structures and best management practices could improve base flow. This model was presented in a Technical Memorandum, dated September 2015, which also provided an evaluation of existing and potential stormwater BMPs for Hanscom Field. As documented in the Technical Memorandum, the model indicated that Hanscom Field is divided into ten separate drainage areas encompassing on and off-site tributaries totaling approximately 1,216 acres. Table 2-5 lists the volume of stormwater that is projected to occur during specific storm events under existing conditions for the ten drainage areas that are illustrated in Figure 2-7.

As part of the stormwater BMPs for Hanscom Field, in the summer of 2017, Massport also removed 9.5 acres of excess airfield pavement around Runway 11/29 to reduce impervious surfaces on the airfield.



- | | | | |
|--|---|--|---------------------------|
| | Massport Property within MMNHP Congressional Boundary | | Existing Sewer |
| | Hanscom AFB Property Boundary | | Hydrology |
| | Municipal Boundary | | Drainage Area Boundary |
| | Interstate | | Drainage Area Designation |
| | Highway | | |
| | Road | | |



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Drainage Area and Outfall Locations

Table 2-5 Hanscom Field Runoff Summary

Basin/ Discharge Location	Drainage Area (Acres)	Percent Impervious	Storm Event Runoff (Cubic Feet per Second)				
			2 Year	5 Year	10 year	25 Year	100 Year
Shawsheen River							
1	312.9	62	139.5	195.8	246.4	304.8	400.4
2	37.3	99	38.1	47.9	56.4	66.2	81.9
3	2.2	50	4.1	5.9	7.6	9.5	12.6
4	53.3	36	6.3	13.2	19.2	26.6	39.5
5	33.1	36	10.4	18.1	25.6	34.9	50.9
6	75.4	36	6.8	13.2	19.9	28.5	43.8
Elm Brook							
7	242.0	0	19.4	40.2	62.8	92.3	146.3
8	51.9	42	21.7	33.6	44.7	58.0	80.4
9	237.8	25	26.8	45.1	63.0	84.9	123.0
Wetlands							
10	170.7	21	38.6	62.4	85.5	113.5	161.2
Notes: 1. Drainage Area No. 1 Includes 39 acres of USAF property. 2. Drainage Area No. 2 Includes 20.5 acres of USAF property. 3. Drainage Area No. 9 Includes 5.5 acres of USAF property. 4. Drainage Area No. 10 Includes 11.5 acres of USAF property. Source: SWPPP, Massport, 2017.							

Drainage Area 1: Drainage Area 1 drains to three 72-inch (1A, B, and C) and two 54-inch (1D and 1E) circular storm drains that discharge to the Shawsheen River. The five pipes collect runoff from an area of approximately 313 acres that includes land areas occupied by Massport, Signature, Jet Aviation, Nagle Aircraft, Liberty Mutual, and a portion of USAF property. Jet Aviation's fuel farm is also included in the drainage area for Outfalls 1A-1E.

Drainage Area 2: The contributing drainage area to Outfalls 2A-2C consists of approximately 37 acres from Hanscom Field, which drains into three 72-inch circular storm drains (Outfalls 2A-2C) that discharge to the Shawsheen River. These 72-inch drains also collect runoff from USAF Property (upstream of Hanscom Field), which is not included in the SWPPP. The area contributing to these outfalls includes the land occupied by the Signature hangars and its fuel farm.

Drainage Area 3: This drainage area collects runoff from a small mostly vegetated area of approximately 2 acres and discharges to the Shawsheen River through an 18-inch pipe (Outfall 3).

Drainage Area 4: This 53-acre tributary area drains to Outfalls 4A and 4B and includes runway and infield area that discharges through two 24-inch pipes to the Shawsheen River.

Drainage Area 5: Drainage Area 5 includes runway and infield area of approximately 33 acres that contributes runoff via an overland flow to the Shawsheen River.

Drainage Area 6: Drainage Area 6 includes runway and infield area of approximately 75 acres that contributes runoff via drainage swale to the Shawsheen River.

Drainage Area 7: This is an undeveloped vegetated area of approximately 242 acres that contributes runoff to Elm Brook via overland flow.

Drainage Area 8: This drainage area collects runoff from approximately 52 acres of runway and infield area and discharges through a 36-inch pipe (Outfall 8). The discharge flows via drainage swale (approximately 900 feet) to Elm Brook.

Drainage Area 9: This area is a 238-acre basin that contributes runoff to Outfall 9. A large portion of this area (Area B) is comprised of a runway with associated grassed infield. This area includes approximately 5.6 acres of U.S. Navy property. Rectrix and Draper Laboratory are located in this drainage area. It discharges through a 54-inch reinforced concrete pipe at a location approximately 500 feet from Elm Brook.

Drainage Area 10: Outfall 10 receives runoff from 170 acres of land that consist of runway and infield areas. This area discharges through a 48-inch reinforced concrete pipe to the wetland area north of the airport.

2.4.6 Hazardous Material Management

Drainage areas 1 and 2 contain facilities that are reported to store and use hazardous materials, including fuel oils and chemicals. Massport has developed a Spill Prevention Control and Countermeasures (SPCC) Plan that covers general Massport operations. Tenants that store a total of more than 42,000 gallons of oil in underground storage tanks (USTs) or more than 1,320 gallons of oil in above-ground storage tanks (AST) or containers are required to have a SPCC Plan as required under 40 CFR 112 (Oil Pollution Prevention). Table 2-6 lists the hazardous materials that are likely to be present at Hanscom.

Table 2-6 Hanscom Field List of Hazardous Materials

Fuels	Miscellaneous Materials	Waste Materials	Vehicle Maintenance Materials
Jet Fuel A	Parts Cleaners	Waste mix oils	Hydraulic Fluid
Low Lead 100 Fuel	Ethylene Glycol	Battery Acid	Transmission Fluid
Gasoline	Propylene Glycol	Waste Jet Fuel	Brake Fluid
Kerosene	Paint		
Number 2 Heating Oil	Magnesium Chloride		
Motor Oil	Calcium Chloride		
Turbine Oil	Sodium Formate		
Gasoline	Cleaners/Detergents		
Source: Massport, 2018.			

Spills of hazardous materials on site must be immediately reported to the Massport Fire Department. Notification to the National Response Center and the MassDEP is also required if the amount exceeds the Reportable Quantity threshold or enters a catch basin or drain. All spills shall be documented in writing to Massport's Operations and Environmental Management Departments.

Spills exceeding the reportable quantity limits established in Table 302.4 - List of Hazardous Substances and Reportable Quantities of 40 CFR 302 and Table 1 - Massachusetts Oil and Hazardous Materials List 310 CMR 40.1600, Subpart P, must be reported to the National Response Center and MassDEP, respectively. The Reportable Quantities established by these regulations for the most common materials handled at Hanscom are provided in the SWPPP, Laurence G. Hanscom Field, Bedford, Massachusetts, along with the spill reporting contact list.

2.4.7 Floodplain

The latest Federal Emergency Management Agency (FEMA) mapping was completed in 2010 with an additional revision in 2014 for Middlesex County, which included the Towns of Bedford, Concord, Lexington, and Lincoln. Previously, separate Flood Insurance Rate Maps (FIRMs) were prepared for each identified flood prone incorporated community and the unincorporated areas of the county. The last FIRM revision for the Town of Bedford and Town of Concord took place in 1988, for the Town of Lexington in 1983, and for the Town of Lincoln in 1986.

2.4.8 Electrical Distribution System

Hanscom Field electrical power is provided primarily by Eversource Energy (formerly NSTAR Electric and Gas). Electrical services for facilities located in Concord are provided by Concord Municipal Power and Light (CMPL). For the most part, the Hanscom Field and Hanscom AFB

electrical distribution systems are separate. The few exceptions are power supplies to some navigational aids.

The overall capacity of the electrical system is approximately 800kVA. The existing system has sufficient capacity to accommodate some additional power demands by existing tenants and buildings. To meet future demands, additional electrical capacity may be required. The 5kV supply from Eversource is small, considering the demand placed by the airfield and buildings. Electricity generation is also conducted at one location at Hanscom Field. A solar photovoltaic array was constructed on the roof and south-facing exterior walls of the Civil Air Terminal in 2011 as part of a roof renovation project. The system was modeled to produce over 57,233 kilowatt-hours (kWh) of electricity per year, or up to 10 percent of the total building electricity requirement. Currently, the installation provides 4 percent of the building's annual energy needs.²¹

For any periods when it is producing more electricity than the building requires, the electricity flows back to the on-site distribution system for consumption by other facilities.

2.4.9 Natural Gas

Natural gas is supplied by National Grid through a 4-inch high pressure main that comes onto airport property from Route 2A along Hanscom Drive. Gas is used for heating purposes with demand peaking during the winter months. This gas service was increased from a 2-inch high pressure main in order to supply the new hangars and conversion of the Civil Air Terminal building to gas heat, and construction by the USAF of a new Commissary facility. This four-inch line can accommodate future development.

2.4.10 Telephone/Communications

Comcast internet and telephone services are wired for the West Ramp at Hanscom Field. Verizon also provides telephone services at the Airport. Telephone service lines enter along Hanscom Drive on overhead poles to the West Ramp. The lines then run in underground conduits, which are routed to each of the facilities at Hanscom Field. Telephone conduit capacity is adequate to meet current demand although routine service upgrades may be required to provide a sufficient number of lines for future conditions.

2.4.11 Tank Management Program

Beginning in 1993, Massport instituted a tank management program designed to track the age and physical characteristics of all Massport-owned and operated fuel storage tanks at Hanscom Field. The purpose of this program is to maintain current tank information and ensure that tanks comply with the current AST and UST regulatory requirements.

²¹ Massport. 2018. *Sustainable Massport, Annual Sustainability & Resiliency Report*.
http://www.massport.com/media/2774/massport-annual-sustainability-and-resiliency-report-2018_lr.pdf

In 1995, the Massport Environmental Management Unit established a database of all Massport- and tenant-owned tanks identified at Hanscom. This regularly updated database tracks more than 50 tanks that are currently in use, have been removed, or have been replaced. Information on tenant tanks is obtained from tank permits filed with the Massport Fire Department. Massport records show that its existing tanks are currently in compliance with applicable state and federal regulations. Massport will continue to monitor the condition of all active tanks to ensure proper functioning and regulatory compliance.

Since 2005, the ASTs at Hangar 10 were removed. In 2010, Massachusetts State Tank Regulations were revised, and regulatory jurisdictions are now assigned by tank size and position (above or below the ground). Storage tanks on Massport property are now regulated by various jurisdictions—ASTs of less than 10,000-gallon capacity by the Massport Fire Department, ASTs of greater than 10,000-gallon capacity by the Massachusetts Department of Fire Services, and USTs by the MassDEP. As of 2010, AST permits must be renewed annually; however, UST permits no longer expire. Active smaller ASTs, larger ASTs, and USTs at Hanscom Field are listed in Table 2-7, Table 2-8 and Table 2-9, respectively.

Table 2-7 Active ASTs Less Than 10,000 Gallons at Hanscom Field

Tank ID	Owner	Location	Volume (gals.)	Content
HANAM-0073	Massport	T-hangar Building 37	275	D
HANAM-1801	Massport	Building #20, Maintenance Shop	275	HO
HANAM-1802	Massport	Airfield Lighting Vault	925	D
HANAM-1900*	Massport	Building #31	215	D
HANAT-0050	Jet Aviation	380 Hanscom Drive	3,000	G
HANAT-0054	Stream Enterprises	140 Hanscom Drive	1,000	D
HANAT-0061	Signature Flight Support	East ramp	6,000	G
HANAT-0062	Signature Flight Support	East ramp	6,000	D
HANAT-0064	Signature Flight Support	NW corner of Building 13	275	D
HANAT-0071	Signature Flight Support	Hangar 1	275	HO
HANAT-0072	Signature Flight Support	Hangar 1	275	D
HANAT-0076	Liberty Mutual	230 Hanscom Drive, Building #16	2000	D
HANAT-0079	Boston MedFlight	Hangar 2 (in front, airside)	400	D
HANAT-1004	Jet Aviation	Building #17, Jet Aviation	350	D
HANAT-1005	Jet Aviation	Building #17, Jet Aviation	600	WO
HANAT-1048	Rectrix	Building #44	5000	Avgas
HANAT-1049	Rectrix	Building #44	500	D
Notes: D = diesel G = gasoline HO = heating oil WO = waste oil *Proposed AST Source: Massport AST and UST Monthly Inspection Matrix – April, 2019				

Table 2-8 Active ASTs Greater Than 10,000 Gallons at Hanscom Field

Tank ID	Owner/ Operator	Location	Volume (gals.)	Content	Permit Expiration
HANAT-0047	Jet Aviation	380 Hanscom Drive	20,000	JA	1/15/2022
HANAT-0048	Jet Aviation	380 Hanscom Drive	20,000	JA	1/15/2022
HANAT-0049	Jet Aviation	380 Hanscom Drive	12,000	AG	1/15/2022
HANAT-0059	Signature Flight Support	East Ramp	15,000	JA	1/15/2022
HANAT-0060	Signature Flight Support	East Ramp	10,000	AG	1/15/2022
HANAT-0063	Signature Flight Support	East Ramp	15,000	JA	1/15/2022
HANAT-0066	Signature Flight Support	East Ramp	15,000	JA	1/15/2022
HANAT-1046	Rectrix	Building #44	20,000	JA	1/15/2022
HANAT-1047	Rectrix	Building #44	20,000	JA	1/15/2022
Notes: AG = AvGas JA = Jet A Source: Massport 2018					

Table 2-9 Active USTs at Hanscom Field

Tank ID ¹	Owner/ Operator ²	Location	Volume	Content
HANBM-0026	Massport	Building maintenance shop	1,000	HO
HANBM-0043	Massport	Field maintenance garage	6,000	G
HANBM-0044	Massport	Field maintenance garage	6,000	HO
HANBM-0045	Massport	Field maintenance garage	6,000	D
HANBT-0065	FAA	ATCT	2,500	D
HANBT-0067	Liberty Mutual	Liberty Mutual Hangar	25,000	JA
Note: 1. Tank list updated May 2018. 2. All underground storage tanks on Massport property are permitted by Massport Fire and no longer expire. HO = heating oil G = gasoline D = diesel JA = Jet A Source: Massport AST and UST Monthly Inspection Matrix – April, 2019				

Information about Massport's Tenant Audit Program and MassDEP-listed disposal sites at Hanscom Field is provided in Chapter 9 Wetlands, Wildlife and Water Resources. As spills of oil and hazardous materials or wastes occur, or subsurface contamination is encountered, notification is made to the MassDEP and appropriate cleanup is conducted. The location of the spill or area of subsurface contamination is further addressed in accordance with the Massachusetts Contingency Plan (MCP) and the site achieves regulatory closure when no further response actions are needed. The site closure is documented in a Permanent Solution Statement indicating that a condition of no significant risk to human health or the environment exists at the site.

A search of the MassDEP's Online 21E Site File Review database returned data indicating that there are three 21E cases associated with Hanscom Field since 2012, with two notification dates in 2014 and one in 2015, with response action outcome (RAO) status listed. All three have a RAO status that indicates response actions were sufficient to achieve a level of no significant risk.

3

Airport Activity Levels



Aviation activity levels form the basis of the evaluations of ground transportation, noise, and air quality impacts associated with Hanscom Field. This ESPR provides an opportunity to re-assess the forecasts presented in the 2012 ESPR and update the forecasts to reflect current conditions and industry trends. Base year (2017) traffic is compared to forecast activity from the 2012 ESPR and new forecasts for the mid (2025) and long-term (2035) planning horizons are presented and described. The actual operations for 2017 are compared with actual operations in past years to reveal activity trends.

Hanscom Field accommodates all segments of the general aviation (GA) industry including business aviation, air taxi/private charter services, personal flying and flight training. Scheduled commercial passenger services have been available at Hanscom Field in the past, but have not occurred since 2012. This chapter summarizes aviation activity at Hanscom Field and forecasts future levels for both aircraft operations by type and category, and based aircraft.

3.1 Key Findings Since 2012

Forecasts of aviation activity at Hanscom Field were prepared for the near-term 2025 and long-term 2035 planning periods. A key assumption underlying the forecasts is that Hanscom Field will continue to function as a GA reliever for Logan Airport and as the premier business aviation airport in the Greater Boston area.

- ⇒ Hanscom Field functions as a premier full-service GA airport and corporate reliever for Boston Logan International Airport (Logan Airport). There were approximately 129,000 daytime aircraft operations at Hanscom Field in 2017. GA accounted for 99 percent of the operations. Military operations in 2017 account for less than 1 percent.
- ⇒ Single-engine piston (SEP) aircraft account for more than 60 percent of the aircraft operations including approximately 46,000 local training operations and 33,000 itinerant operations for personal flying use.
- ⇒ Hanscom Field also serves the needs of business aviation users, including corporations that own their own aircraft and businesses that charter private flights. Business aviation operations conducted in jets, turboprops and multi-engine piston (MEP) aircraft accounted for 32 percent of Hanscom Field's activity or around 41,000 operations.
- ⇒ In 2017, Hanscom Field had no scheduled passenger commercial service. The airport has not had scheduled passenger commercial service since 2012, when the last ESPR was completed.
- ⇒ Since the last forecast conducted in 2012, Hanscom Field's total aircraft operations have declined by a compound annual growth rate (CAGR)²² of 5 percent annually from approximately 166,000 operations in 2012 to 129,000 in 2017. GA activity is down nationally since 2012, but not to the same extent that Hanscom Field has experienced.²³

Hanscom Field peak operations compared to 2017:

- ⇒ In 1970 tower counts peaked at more than 300,000.
- ⇒ In 1985, after U.S. airline deregulation, operations peaked at 247,000.
- ⇒ In 2017, there were 119,000 fewer operations than in 1985.

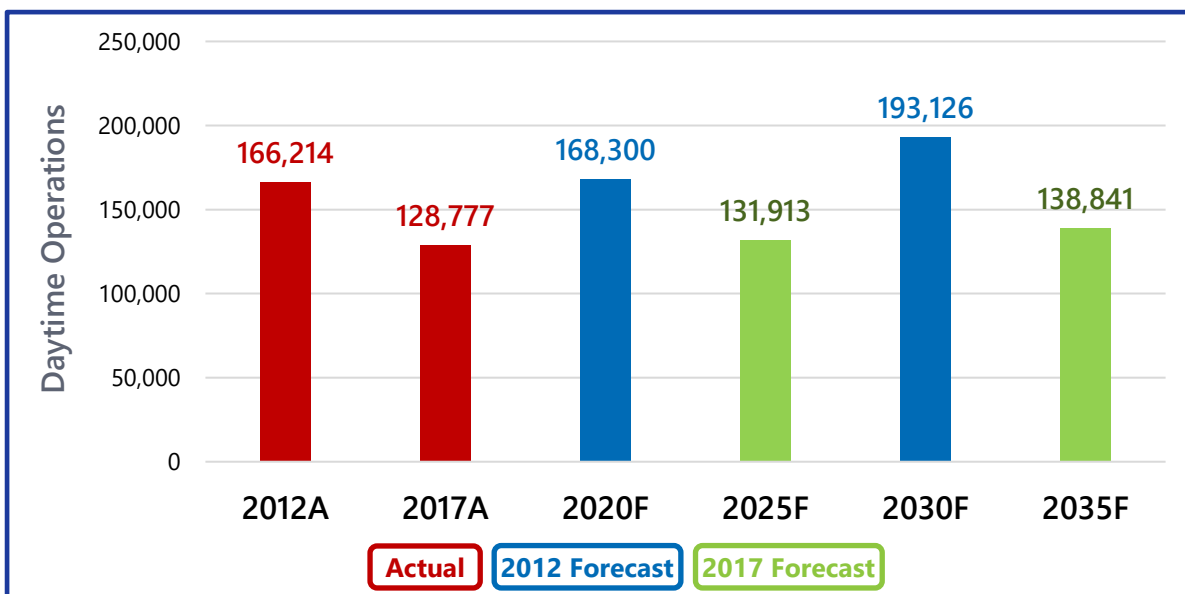
²² Throughout this section, average growth rates over multi-year periods are calculated using compounded annual growth rates, or CAGR. The CAGR is the annual growth rate from the Year 1 value (e.g., aircraft operations, etc.) to the value at the end of the historic or forecast period, with the effect of compounding taken into account. This accurately measures the year-to-year growth.

²³ General Aviation Manufacturers Association (GAMA). 2017 GAMA Annual Report. https://gama.aero/wp-content/uploads/GAMA_2017_AnnualReport_ForWeb.pdf

- ⇒ Business aviation at Hanscom Field has increased at a rate of 2.6 percent from 2012 to 2017. Since 2012, the Massachusetts economy has grown by 2.5 percent with total personal income increasing 1.9 percent.²⁴
- ⇒ Total aircraft operations are forecast to be approximately 131,900 in 2025 and 138,840 in 2035. This is an annual forecast growth rate of 0.4 percent, consistent with the FAA's national forecast.²⁵ Business aviation is the driver of growth with an annual growth rate of 1.9 percent through the forecast period.
- ⇒ The 2017 forecast levels for 2025 and 2035 remain below the actual 2012 levels at Hanscom Field and the 2012 *ESPR* forecast levels, but are consistent with the FAA's Terminal Area Forecast growth rates for Hanscom Field.

Figure 3-1 presents the total daytime operations in 2012 and 2017 compared to the forecast totals for the 2012 *ESPR* future years (2020 and 2030) and 2017 *ESPR* future years (2025 and 2035).

Figure 3-1 Summary of Actual and Forecast Activity at Hanscom Field



Source: 2012 *ESPR* for Hanscom Field and Massport EXP NOMS System; Operations are counted between 7:00AM-11:00PM, the hours that the air traffic control tower is open.

²⁴ Woods & Poole Economics, 2017

²⁵ FAA. FAA Aerospace Forecast Fiscal Years 2018-2038.

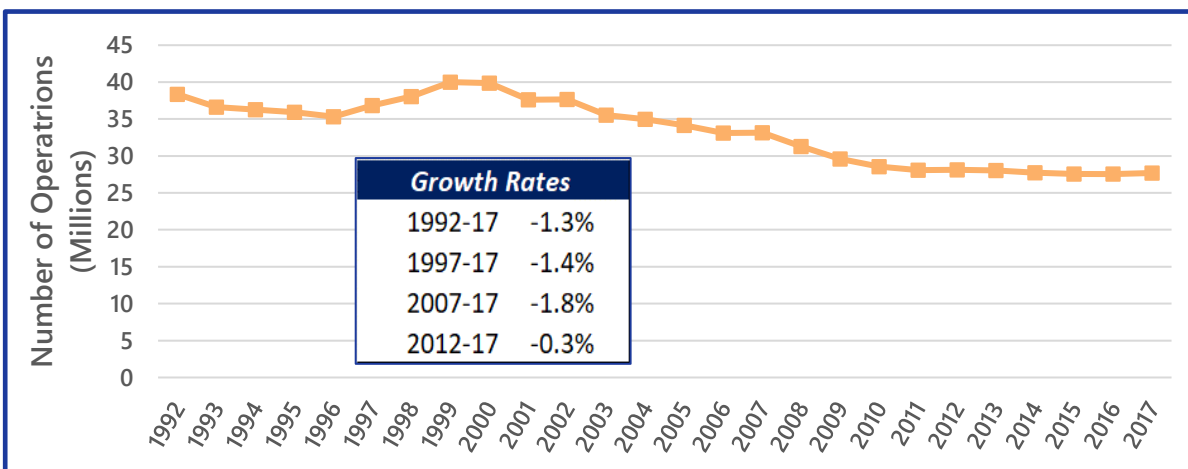
https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2018-38_FAA_Aerospace_Forecast.pdf

3.2 Overview of National General Aviation Trends

Airports are vital parts of the local and regional economy. Hanscom Field is an important contributor to the Massachusetts economy. In 2017, the airport contributed \$679 million in economic output that supported over 2,200 jobs and approximately \$134 million in payroll.²⁶

As shown in Figure 3-2, General Aviation in the U.S. has declined since its peak in 1999 due to a combination of dramatic increases in fuel prices and an unprecedented global recession. GA has yet to recover from the recession in 2008 and 2009, and the decline in operations has continued from the reporting in the previous ESPR in 2012.

Figure 3-2 U.S. GA Operations 1992-2017 (Millions)



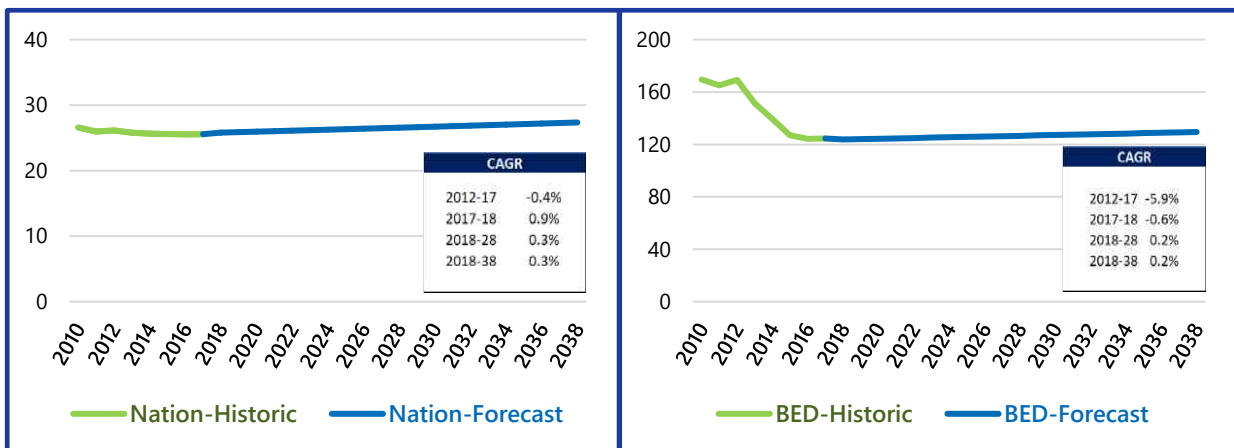
Source: GAMA

While GA shows a declining trend on a national level, a minor increase occurred nationally in 2017 of 0.1 percent due to an increase in local activity. The FAA is forecasting GA operations to continue to grow nationally at 0.3 percent per year through 2038. The FAA develops forecasts for GA operations based on a forecast of fleet size, hours flown and utilization rates. The 0.3 percent growth in GA operations is forecast to come from the business-related sectors of GA. As the largest component of growth nationwide, the turbine aircraft fleet is forecast to grow at 2.0 percent per year through 2038, while their hours flown are forecast to increase 2.4 percent. Operations of rotorcraft, experimental and light sport aircraft are also expected to grow throughout the FAA forecast period of 2038. Despite the growth in business related aviation, overall, the FAA forecasts the GA fleet to remain flat, while hours flown are expected to increase 0.8 percent per year.

²⁶ Massachusetts Statewide Airport Economic Impact Study Update EXECUTIVE SUMMARY JANUARY 2019

The FAA forecasts GA operations to increase modestly between 2018 and 2038 in the United States. As illustrated in Figure 3-3, the FAA's forecasts for Hanscom Field reflects this modest outlook for increases in GA activity with a growth rate of 0.2 percent per year between 2018 and 2038. Some factors contributing to the limited growth rates nationally include the decrease in number of student pilots/leisure GA flights with non-corporate aircraft, due to a combination of the high cost of training and limited employment prospects. Increases in fuel prices between 2009 and 2014 further increased the cost of leisure GA. Nevertheless, higher corporate profits, post-2008 economic recovery, safety and security concerns, and scheduled commercial flight delays make corporate aviation a somewhat more attractive alternate to scheduled commercial aviation.

Figure 3-3 FAA Aerospace Forecast for GA Operations in the U.S. (Millions) and FAA's Terminal Area Forecast for Hanscom Field (Thousands)

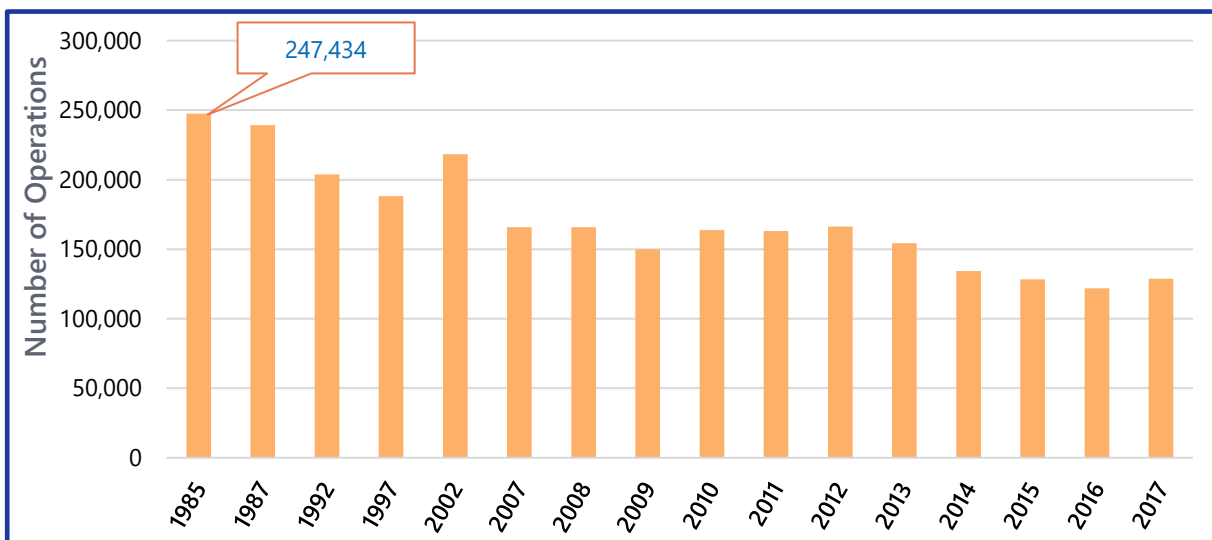


Source: FAA Aerospace Forecast GA and FAA Terminal Area Forecast for Hanscom Field; Includes Itinerant and Local operations

3.3 Overview of Hanscom Field

In 2017, there were approximately 129,000 daytime operations at Hanscom Field. As shown in Figure 3-4, this is a 6 percent increase over 2016, the first year of growth since 2012. This increase in operations from 2016 to 2017 is due in large part to the strong economy in Massachusetts.²⁷ Hanscom Field's operation levels react to the economic stimulus of the region. Hanscom Field's total operations are down 2 percent per year since 2005 and 5 percent per year since 2012, depicted in Table 3-1. This decline has largely been due to a decline in single-engine piston operations both in flight schools and in personal flying. Another difference that has occurred in the past five years is the lack of scheduled commercial passenger service. While scheduled commercial passenger service did not represent a large share of Hanscom Field's operations in 2012, this category of operations is currently not occurring at all at Hanscom Field.

Figure 3-4 History of Total Operations at Hanscom Field



Source: Massport EXP NOMS System, Annual Noise Report for Hanscom Field; Operations between 7:00 AM - 11:00 PM, the hours that the air traffic control tower (ATCT) is open.

²⁷ University of Massachusetts. January 2018. *MassBenchmarks*. <http://www.donahue.umassp.edu/business-groups/economic-public-policy-research/massbenchmarks/benchmarks-bulletin-january-2018>

Table 3-1 Summary of Aircraft Activity at Hanscom Field, 2005 – 2017

Activity	Year			Compound Annual Growth	
Aircraft Operations (7:00AM-11:00PM)	2005	2012	2017	2005-2017	2012-2017
General Aviation					
Training (SEP)	58,535	70,196	46,014	-2.0%	-8.1%
Personal Flying (SEP)	57,894	51,477	33,040	-4.6%	-8.5%
Business Non-Jet (MEP+Turbo)	9,646	10,178	10,846	1.0%	1.3%
Business Jet	32,345	25,638	29,862	-0.7%	3.1%
Helicopter	7,004	7,345	8,256	1.4%	2.4%
Subtotal GA	165,424	164,834	128,018	-2.1%	-4.9%
Military	904	745	759	-1.4%	0.4%
Scheduled Commercial Airline	3,627	635	0	-100.0%	-100.0%
Total Operations	169,955	166,214	128,777	-2.3%	-5.0%
Based Aircraft	387	340	350	-0.4%	0.6%
Note: Operations between 7:00AM and 11:00PM, the hours that the air traffic control tower is open. Source: 2012 <i>ESPR</i> for Hanscom Field and Massport EXP NOMS System.					

In 2017, GA accounts for almost all of the operations that occurred at Hanscom Field with military operations accounting for 0.6 percent. The share of Hanscom Field's 2017 operations is shown in Figure 3-5.

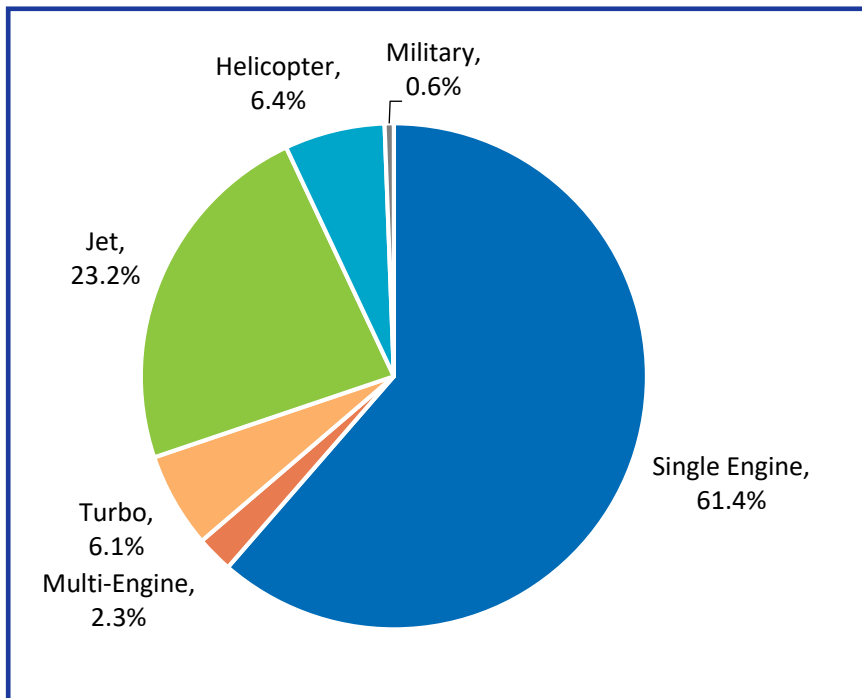
More than 60 percent of the operations that occurred at Hanscom Field were in single-engine piston aircraft utilized for training or personal flying. Hanscom Field is home to two flight schools, and in 2017 more than 46,000 training operations occurred there. While training operations are the largest sector of operations at Hanscom Field, they have declined 8 percent per year since the 2012 *ESPR*.

Personal flying represents the remainder of the single-engine piston aircraft operations at Hanscom Field. In 2017, approximately 33,000 personal flying operations were performed on single-engine piston aircraft.

Business aviation is the second largest sector of operations at Hanscom Field. In 2017, Hanscom Field had about 41,000 business aviation operations. These users may have aircraft based at Hanscom Field, or the aircraft might be based at another airport. Business aviation users include corporations that own their own aircraft, on-demand air taxi and charter operators that provide private air transportation service for hire, or fractional aircraft operators whose customers own a share of an aircraft. Business aviation is conducted by both jet and non-jet aircraft.

Helicopters at Hanscom Field provide medical and emergency services, training, and charter operations. They represent 6.4 percent of Hanscom Field's total operations with 8,300 operations in 2017. Military operations represent less than 1 percent of Hanscom Field's operations, or 759 operations in 2017.

Figure 3-5 Share of Hanscom Field Activity by Operation Type



Source: Massport EXP NOMS System, Operations between 7:00 AM-11:00 PM, the hours that the air traffic control tower is open.

3.3.1 Nighttime Operations at Hanscom Field

Activity at Hanscom Field occurs largely during the day, however, there are limited operations that are performed during the nighttime period. Any operation that occurs between 11:00 PM and 7:00 AM must pay a nighttime fee.²⁸ Nighttime activity varies from year to year. In 2017, there were 1,902 nighttime operations²⁹, accounting for 1.5 percent of total operations at

²⁸ The definition of "nighttime" operations under Massachusetts law, and as reported in the Hanscom Field Annual Noise Report is from 11:00 PM to 7:00 AM. FAA defines "nighttime" as the period from 10:00 PM to 7:00 AM for the purposes of calculating exposure to aircraft noise with the Day-Night Sound Level (DNL) metric. Therefore, the number of operations characterized as "nighttime" for use in determining DNL (described in Chapter 7 of this document) is higher than the number of nighttime operations reported in this chapter.

²⁹ Massport's official aircraft operation counts are based on the FAA Air Traffic Control Tower (ATCT) counts from 7:00 AM to 11:00 PM when the tower is operational. In 2017, there were 1,902 additional aircraft operations during the late night / early

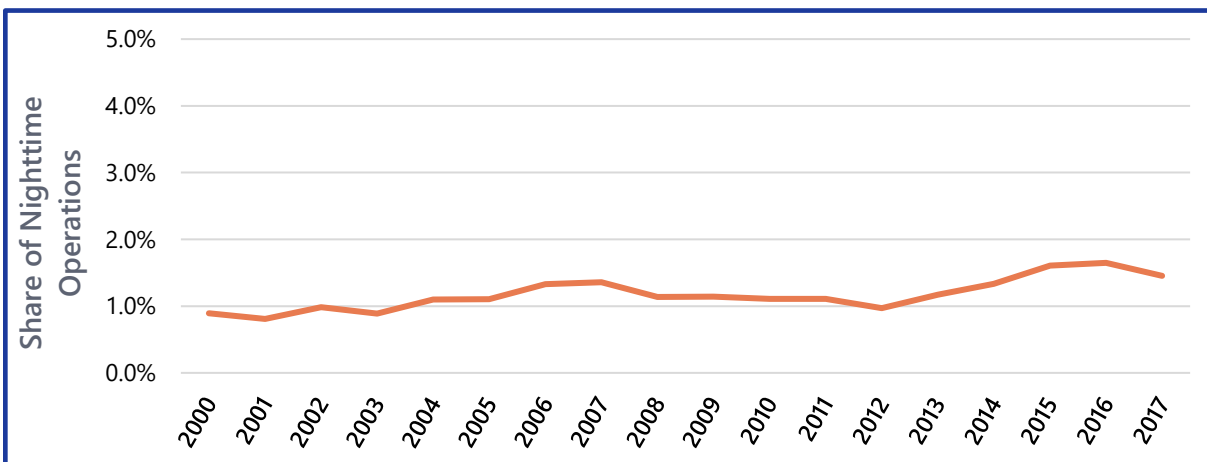
Hanscom Field. This activity largely consists of jet operations, with 1,422 in 2017, which was 75 percent of total nighttime operations. Since the 2012 *ESPR*, nighttime activity has increased 3 percent from 1,631 to 1,902. As shown in Table 3-2, the biggest absolute increases since 2012 have occurred in the jet category, which increased by 249 operations.

Table 3-2 Nighttime Operations at Hanscom Field by Aircraft Category

Nighttime Operations ¹							
Year	Jet	MEP+TP	SEP	Helicopter	Military	Scheduled Commercial Airline	Total
2012	1,173	251	63	141	3	0	1,631
2017	1,422	202	40	219	19	0	1,902
Difference	249	-49	-23	78	16	0	271
Note: 1. Operations between 11:00 PM and 7:00 AM. Source: 2012 <i>ESPR</i> for Hanscom Field and Massport EXP NOMS System.							

As demonstrated in Figure 3-6, annual nighttime activity at Hanscom Field fluctuates by year, but remains a small share of total operations at Hanscom Field. Nighttime operations share of total operations have ranged from a low of 0.8 percent of total operations in 2001 to a high of 1.6 percent in 2016.

Figure 3-6 Historical Share of Nighttime Activity at Hanscom Field



Source: 2012 *ESPR* for Hanscom Field, Annual Noise Reports, Massport EXP NOMS System; Operations between 11:00 PM and 7:00 AM.

morning hours when the tower is closed. The nighttime operations presented in the 2017 *ESPR* differ from those published in the Hanscom Field Annual Noise Report. This discrepancy is due to the difference in the timing of the preparation for the two reports. Each report used the best available data at the time of the analysis for that report. The difference of approximately 0.4 daily nighttime operations, or 0.3% of all daily operations would change computed noise levels by an imperceptible amount and would not change the conclusions of the analysis as presented.

3.3.2 Hanscom Field's GA Operations as Part of the Region

As the premier full-service GA airport and corporate reliever for Boston Logan, Hanscom Field has more GA operations than the other airports that serve the Boston Metropolitan Area.

3.3.3 Review of the 2012 *ESPR* Forecast

Long-term forecasts are imperfect because a number of unforeseen factors may occur over time. This is especially true when forecasting GA trends. GA at Hanscom Field has experienced declines for the following reasons that are specific to this sector:

- ⇒ Higher aircraft costs;
- ⇒ New aircraft instrument requirements by the FAA;
- ⇒ Increasing costs to obtain a pilot's license;
- ⇒ Higher insurance costs, and;
- ⇒ Decreased production of single engine aircraft.

For example, both the spike in fuel prices in 2007 and the Global Recession in 2008 - 2009 were unforeseen and both of these events have had significant effects on aviation activity.

Figure 3-7 compares actual aircraft operation levels at Hanscom Field to predicted levels based on the 2012 *ESPR* forecast. Forecast activity levels for 2013-2017 were interpolated based on 2020 forecasts presented in the 2012 *ESPR*. Hanscom Field's actual aircraft operations for 2017 were lower than the activity levels predicted in 2012 *ESPR* by approximately 37,000 operations. Although the recession occurred nearly a decade ago, GA at Hanscom Field has still not recovered to pre-recession levels. Table 3-3 compares Hanscom Field to the other airports serving the region.

Since 2012, Hanscom Field's GA operations have declined 4.9 percent annually. Similarly, 7 of the 10 other airports that serve the region have also experienced declines in GA. Logan Airport, Manchester-Boston Regional Airport and Nashua Boire Field experienced increases in GA activity since 2012, with Logan Airport increasing 2.1 percent per year.

Table 3-3 GA Operations at General Aviation Reliever and Commercial Service Airports in the Boston Metropolitan Area, 2012 – 2017

Airport	NPIAS Category ¹	General Aviation Operations ²		Compound Annual Growth Rate	Percent Local	Number of Based Aircraft 2017
		2012	2017		2017	
Hanscom Field	Nonhub primary	164,834	128,018	-4.9%	36.0%	370
Norwood Memorial	Nonprimary reliever	68,405	66,823	-0.5%	36.2%	118
Nashua/Boire Field	Nonprimary reliever	55,620	56,352	0.3%	52.4%	251
Beverly Municipal	Nonprimary reliever	58,203	53,401	-1.7%	49.3%	102
Laurence Municipal	Nonprimary reliever	52,157	36,822	-6.7%	41.3%	213
Portsmouth International (Pease)	Nonhub primary	38,132	36,717	-0.8%	71.5%	143
Boston Logan International	Large hub	28,144	31,120	2.1%	0.0%	-
Worcester Regional	Nonhub primary	44,070	25,683	-10.2%	32.6%	75
T.F. Green	Small hub	26,274	24,797	-1.2%	36.1%	37
Bradley International	Medium hub	15,589	13,233	-3.2%	1.8%	65
Manchester-Boston Regional	Small hub	12,504	13,169	1.0%	21.0%	67
Total		563,902	486,135	-2.9%	38.6%	1,441

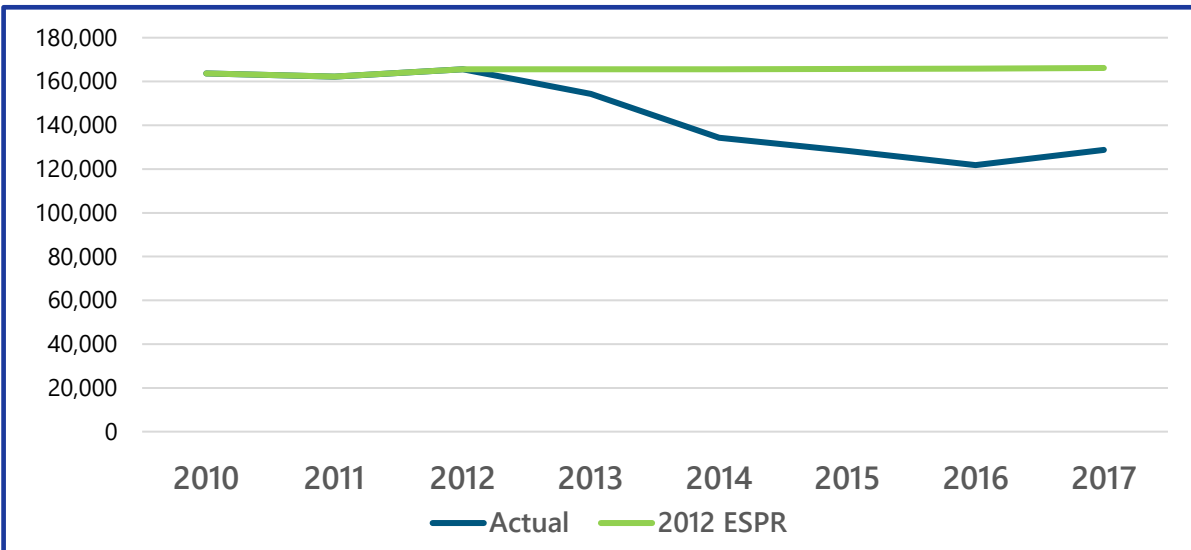
Notes:

1. The National Plan of Integrated Airport Systems (NPIAS) includes all commercial service airports, all reliever airports, and selected public-owned general aviation airports.

2. Operations include itinerant air taxi, general aviation, and local civic operations. Manchester-Boston Regional, T.F. Green, and Bradley International Airport operations exclude air taxi operations as their operations counts are comingled with regional commuter airline operations.

Sources: FAA Traffic Flow Management System Counts (TFMSC), FAA Terminal Area Forecast (TAF); Hanscom Field and Logan International Airport counts are provided by Massport.

Figure 3-7 ESPR Forecast Operations Compared to Actual Operations (GA Plus Military Activity at Hanscom Field)



Source: 2012 ESPR for Hanscom Field, Massport EXP NOMS System and Annual Noise Reports

Table 3-4 presents the comparison of actual 2017 operations to the previous forecast, broken down by aircraft category. The biggest discrepancies between the forecast and actual 2017 operations were in the single-engine piston categories. Flight training is 30 percent lower than the 2012 ESPR predicted, while personal flying is 35 percent lower. However, turboprop and helicopter operations at Hanscom Field were higher than predicted by 15 and 12 percent respectively.

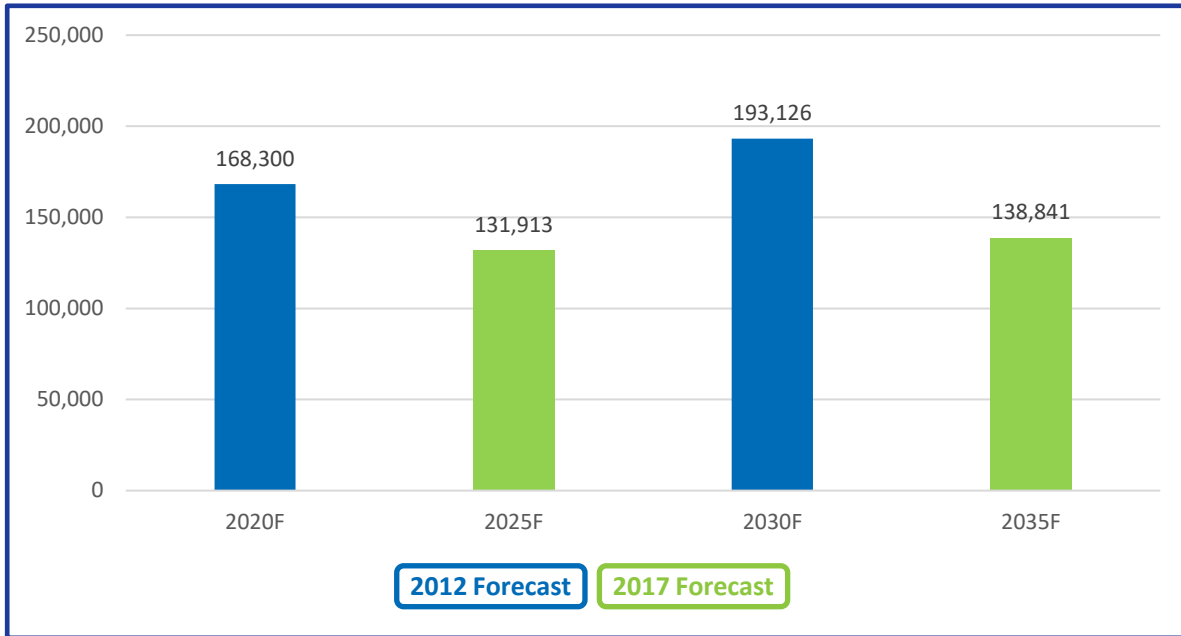
Table 3-4 2012 ESPR Forecast and Actual 2017 GA Daytime Activity at Hanscom Field

Activity	Actual	2012 ESPR	Difference	
	2017	2017	Absolute	Percent
Training SEP	46,014	65,350	-19,336	-30%
Personal SEP	33,040	50,965	-17,925	-35%
MEP	3,015	3,809	-794	-21%
Turbo	7,831	6,789	1,042	15%
Jet	29,862	31,168	-1,306	-4%
Helicopter	8,256	7,345	911	12%
Military	759	745	14	2%
Total	128,777	166,172	-37,395	-23%

Source: Massport EXP NOMS System and 2012 ESPR for Hanscom Field, Operations between 7:00AM-11:00PM, the hours that the air traffic control tower is open

The 2012 *ESPR* included forecast operations for 2020 and 2030 at Hanscom Field. This forecast of operations included all sectors of GA, scheduled commercial passenger service and military. While the overall growth rate of the 2012 forecast was only 0.8 percent per annum, the overall forecast levels were expected to be higher in 2020 and 2030 than the current forecast predicts for 2035. This is shown in Figure 3-8 and Table 3-5.

Figure 3-8 2012 *ESPR* Operations Forecast (2020F and 2030F) Compared to the 2017 *ESPR* Operations Forecast (2025F and 2035F) at Hanscom Field



Source: 2012 *ESPR* for Hanscom Field

Table 3-5 2012 vs. 2017 *ESPR* Operations Forecast at Hanscom Field

Activity	2012 <i>ESPR</i> Forecast		2017 <i>ESPR</i> Forecast	
	2020	2030	2025	2035
Training (SEP)	62,605	65,164	41,795	40,723
Personal Flying (SEP)	50,661	58,285	29,208	28,252
Business MEP	3,837	4,321	2,907	2,879
Business Turbo	7,024	8,664	10,189	12,205
Business Jet	35,043	46,782	36,515	41,907
Helicopter	7,345	7,345	9,522	10,332
Military	745	745	759	759
Scheduled Commercial Airline	1,040	1,820	1,019	1,783
Total¹	168,300	193,126	131,913	138,841

Note:

1. Operations between 7:00AM and 11:00PM, the hours that the Air Traffic Control Tower is open.

Source: 2012 *ESPR* for Hanscom Field.

3.4 Aviation Activity Forecasts

The forecasts for aviation activity at Hanscom Field include projections of aircraft operations and based aircraft for the near-term (2025) and the long-term (2035). The forecasts assume that Hanscom Field continues to act as a GA reliever for Logan Airport, and as the premier business aviation airport for the Greater Boston area. The forecast also assumes that military operations will remain limited. In addition, the forecast assumes that the airport could again offer scheduled commercial airline operations in 2025. The addition of scheduled commercial service is a scenario that could occur given that the airport has had scheduled commercial service in the past. The scheduled commercial service forecast is consistent with previous forecasts and illustrative of what may occur in the future (not necessarily what will occur). However, for scheduled commercial service to commence at Hanscom Field, the carrier must comply with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services in aircraft with more than 60 seats. The operations forecast is based on historical trends at Hanscom Field along with national trends for GA. The forecast also takes economic projections into consideration, given the well-documented relationship between the economy and GA activity. The forecast for Hanscom Field is shown in Table 3-6.

Table 3-6 Forecast of Operations at Hanscom Field

Activity	Actual		Forecast		Compound Annual Growth			
	2012	2017	2025	2035	2012-17	2017-25	2025-35	2017-35
Training (SEP)	70,196	46,014	41,795	40,723	-8.1%	-1.2%	-0.3%	-0.7%
Personal Flying (SEP)	51,477	33,040	29,208	28,252	-8.5%	-1.5%	-0.3%	-0.9%
Business MEP	3,763	3,015	2,907	2,879	-4.3%	-0.5%	-0.1%	-0.3%
Business Turbo	6,415	7,831	10,189	12,205	4.1%	3.3%	1.8%	2.5%
Business Jet	25,638	29,862	36,515	41,907	3.1%	2.5%	1.4%	1.9%
Helicopter	7,345	8,256	9,522	10,332	2.4%	1.8%	0.8%	1.3%
Military	745	759	759	759	0.4%	0.0%	0.0%	0.0%
Scheduled Commercial Airline	635	0	1,019	1,783	-100.0%	N/A	5.8%	N/A
Total	166,214	128,777	131,913	138,841	-5.0%	0.3%	0.5%	0.4%

Source: 2012 ESPR for Hanscom Field and Massport EXP NOMS System, InterVISTAS for forecast years.

3.4.1 General Aviation Forecast Operations

In 2017, over 99 percent of Hanscom Field's operations were GA related. GA activity at Hanscom Field is forecasted to grow at a rate of 0.3% per year through 2035. This growth is driven by the business aviation sector, while single engine piston flying continues to decline.

Training Operations

Training operations are expected to decline over the forecast period from approximately 46,000 in 2017 to approximately 41,000 in 2035. This is an average annual decline of 0.7 percent, which is a slower decline than the historical rate of 8.1 percent per year from 2012-2017. The forecast decline reflects the national FAA projection of a decline in both the number of single-engine piston aircraft, and the number of hours flown by student pilots.

Personal Flying Operations

Similar to projected reduction of training operations, personal flying operations in single-engine piston aircraft are expected to decline throughout the forecast period. Over the past 5 years, personal flying has declined at Hanscom Field by an average 8.5 percent per year. This is a decrease of more than 18,000 operations over 5 years. While the decline is projected to continue, it is not anticipated to occur at the same rate as has occurred since 2012. For the forecast period of 2018 - 2035, personal flying operations in single-engine piston aircraft are projected to decline an overall average of 0.9 percent per year. By 2035, personal flying operations are projected to be about 28,000, down from 33,000 in 2017.

Business Aviation

The near- and long-term outlook for business aviation is strong. The FAA assumes that business aviation will continue to grow nationally as the economy is projected to continue to grow.³⁰ Business aviation remains an attractive option for corporations given the greater flexibility of schedules, ability to reach destinations without stops, and the ability to avoid lengthy check in and security screening times, thus allowing corporate passengers to use their time more effectively. Business aviation activity has historically been closely linked to the health of the overall economy.

Business aviation activity at Hanscom Field has historically tracked with the state of Massachusetts' Gross Regional Product and is predicted to increase at 1.9 percent per year. Total annual business aviation operations are forecast to reach around 57,000 by 2035, an increase from the approximately 41,000 total annual business operations in 2017.

³⁰ FAA Aerospace Forecast FY 2018-2038

Helicopter Operations

Since 2012, helicopter operations have increased 2.4 percent annually, with 8,256 operations in 2017. Since there has been an increase in recent years, helicopter operations are forecast to grow throughout the specified period at 1.3 percent per year. Total helicopter operations are predicted to reach approximately 10,300 annually in 2035.

3.4.2 Military Operations

Since the military's function at Hanscom Field does not involve an active flying mission, annual military operations are less than one percent of the total aircraft operations at the airport. The forecast assumes that the military operations continue throughout the forecast period but remain constant at the 2017 level of 759 operations.

3.4.3 Scheduled Commercial Airline Activity

Hanscom Field has been without scheduled commercial airline passenger services since Streamline Air discontinued its operations at the airport in September 2012. Since the *2012 ESPR*, airlines have continued the trend of withdrawing from or scaling back services at many smaller, secondary markets. As the industry continues to evolve, Hanscom Field is forecast to support a modest level of scheduled commercial activity consistent with the previous forecast. The scheduled commercial airline services forecast is based on a scenario of the type of services and the type of airline that may initiate operations at Hanscom Field and is not a continuation of past trends, but considers the current and projected operating environment for U.S. air carriers.

The scheduled commercial airline forecast scenario assumes that the types of service that may be implemented at Hanscom Field would be similar to the service most recently provided. This includes a small regional airline or public charter provider operating small turboprop or regional jet aircraft to short-haul business markets.

The forecast services would comply with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services in aircraft with more than 60 seats. The Hanscom Field forecast specifically assumes weekday service operated with a 30-seat turboprop aircraft (Embraer Brasilia) serving one or two destinations in the Northeast. This service could also be conducted by a 50-seat regional jet, but for the purposes of this analysis the Embraer Brasilia is the assumed aircraft. The forecast scenario details are summarized in Table 3-7. The scheduled commercial service forecast is illustrative of a potential scenario that could occur at Hanscom Field in the future. The future scenarios in Table 3-7 are based on a number of assumptions and are not based on specific plans proposed by any potential service providers. The forecasts represent a high-level analysis as part of the overall future activity forecast.

Table 3-7 Summary of Forecast Scheduled Commercial Passenger Service Assumptions, 2025 and 2035

Forecast Scheduled Commercial Passenger Service Assumptions	
Aircraft Type:	Small turboprop with 30 seats, e.g. Embraer 120
Number of Nonstop Markets:	One in 2025 Two in 2035
Types of Markets:	Business destination in the northeast, e.g., Trenton
Service Frequency:	Two roundtrips per market, five days a week
Average Load Factor:	70.0% in 2025 72.5% in 2035
Completion Factor:	0.98

As shown in Table 3-8, Hanscom Field could potentially accommodate 21,403 scheduled commercial airline passengers by 2025 and 44,335 in 2035. With weekday-only services provided to one destination in 2025, annual scheduled commercial airline operations are forecast at 1,019, with a 0.98 completion rate. In 2035, under the assumption of weekday services to two destinations, annual operations increase to 2,038, with the same 0.98 completion rate. Since the scenario assumes that services would be targeted to the business traveler, the 2035 forecast assumes that one daily departure would occur in the early morning before 7:00 AM. Thus, in the 2035 forecast, 1,783 scheduled commercial airline operations would occur between 7:00 AM and 11:00 PM, and 255 scheduled commercial airline are assumed for the 11:00 PM to 7:00 AM period.

As can be seen in Table 3-8, the 2017 *ESPR* forecast for scheduled commercial passenger service predicts slightly lower numbers of operations than the 2012 *ESPR* forecasts for 2020 and 2030.

Table 3-8 Forecast Scheduled Commercial Passenger Airline Activity at Hanscom Field, 2025 and 2035

Activity	Actual		2017 <i>ESPR</i> Forecast		2012 <i>ESPR</i> Forecast	
	2005	2012	2025	2035	2020	2030
Aircraft Operations	3,627	635	1,019	2,038	1,040	2,080
Passengers	17,457	8,609	21,403	44,335	20,280	40,560
Passengers per Operation	4.8	13.6	21.0	21.8	19.5	19.5
Source: 2012 <i>ESPR</i> for Hanscom Field, InterVISTAS Analysis for forecast years.						

Procedures for New-Entrant Airlines

An airline proposing to commence scheduled service at Hanscom Field must comply with established FAA and Massport requirements for new entrant airlines. At the federal level, a new entrant to Hanscom Field must have its Operations Specifications ("OpSpecs") amended by the FAA to permit services to Hanscom Field with a specified type of aircraft. OpSpecs must be amended each time an airline adds a new destination from any airport or uses a new type of aircraft at an airport. Once an amendment is granted for a specific market and aircraft type, additional amendments or approvals are not needed to increase the frequency of service.

New scheduled commercial service at Hanscom Field proposed by new airline entrants must be consistent with the Master Plan and 1980 Massport Regulations. The Master Plan provides that the economic, noise and ground access impacts of new passenger or air cargo service proposals will be reviewed with the Hanscom Field Advisory Commission. Massport Regulations prohibit commercial passenger services at Hanscom with aircraft that have more than 60 seats.

As a prerequisite to entering into an operating agreement with Massport, an airline must submit to Massport all valid and current certifications, authorizations, and approvals from all state, federal and other governmental bodies applicable to the proposed aircraft type and operations. Specifically, an airline must submit its FAA-approved OpSpecs authorizing the proposed service at Hanscom Field, in accordance with applicable provisions of federal law. Thus, no new carrier may begin service until all necessary approvals have been secured.

3.4.4 Nighttime Operations

Total nighttime aircraft operations (11:00 PM to 7:00 AM) are forecast to increase from 1,902 in 2017 to 2,972 in 2035. This is shown in Table 3-9. The forecast of nighttime operations for Hanscom Field are based on the forecast of annual activity by aircraft type. In 2017, approximately 4.5 percent of jet operations and 1.8 percent of turboprop/ multi-engine piston operations occur during the nighttime hours.

By 2035, jet aircraft are forecast to fly approximately 2,000 nighttime operations, which accounts for 66 percent of the forecast nighttime activity. Turboprop and multi-engine piston operations during nighttime hours are forecasted to reach 292 operations by 2035. Nighttime scheduled commercial airline operations are included in the 2035 forecast at 255 annual operations.

Table 3-9 Forecast of Nighttime Activity at Hanscom Field

Year	Nighttime Operations						Total
	Jet	MEP+TP	SEP	Helicopter	Military ¹	Scheduled Commercial Airline	
2012	1,173	251	63	141	3	0	1,631
2017	1,422	202	40	219	19	0	1,902
2025	1,716	254	88	342	-	0	2,399
2035	1,969	292	85	371	-	255	2,972

Notes:

1. The future years forecast does not include consideration of military nighttime operations.

2. Total future operations are rounded up.

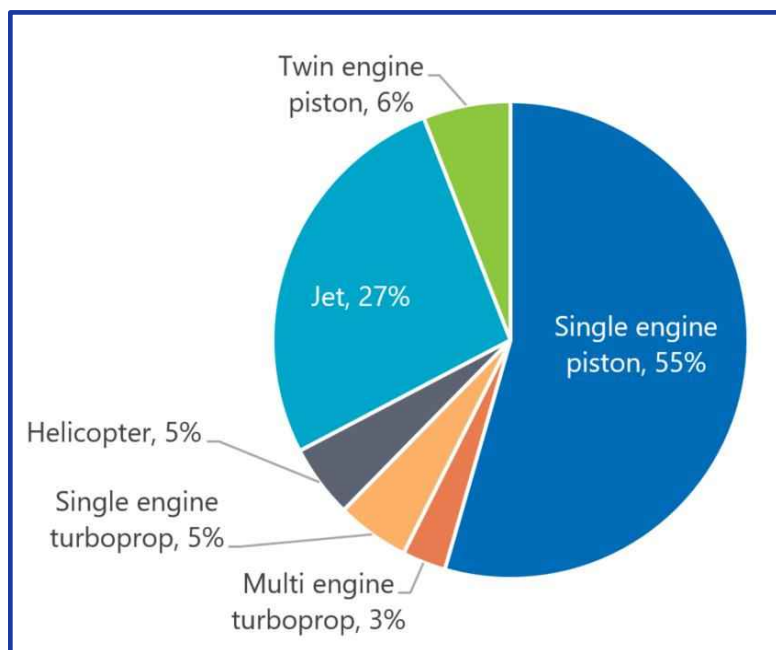
Source: 2012 ESPR for Hanscom Field and Massport EXP NOMS System

3.4.5 Based Aircraft Forecast

As of June 2018, Hanscom Field had 350 based aircraft. This figure is higher than 2012, when there were 340 aircraft based at the airport. Since 2012, based aircraft has grown 0.5 percent per year. This slower growth can be attributed to a decline in total operations between 2012 and 2017, along with hangar capacity constraints. Almost 55 percent of the based aircraft are of the single engine piston type, with the majority of them stored in T-Hangars on the Airport. Jets comprise the next largest share of based aircraft with an almost 27 percent share, and these are primarily sponsored by the three FBOs. The distribution of aircraft by type is provided in Figure 3-9.

Aircraft based at Hanscom Field are projected to increase over the forecast period from 350 aircraft in 2017 to 447 aircraft in 2035, as shown in Table 3-10. This represents a compound annual growth of 0.9% between 2017 and 2025 and 1.8 percent between 2025 and 2035. Forecast growth for each aircraft type was calculated from the operations forecast and adjusted based on the overall shifts toward

Figure 3-9 Hanscom Field Based Aircraft by Type, 2017



Source: Massport

business jet operations and away from piston aircraft, as personal flying decreases and business aviation increases. As jet aircraft shift from 23 percent of the operations in 2017 to almost 31 percent in 2035, the share of based jet aircraft increases to 34 percent of the fleet. Single engine pistons decline to 44 percent of the based aircraft fleet as their share of total operations decline in the operations forecast.

Table 3-10 Based Aircraft Forecast

Aircraft Type	2012	2017	2025	2035
Single Engine Piston (SEP)	217	191	178	195
Single Engine Turboprop ¹	-	17	23	31
Multi Engine Piston (MEP) ¹	-	21	21	23
Multi Engine Turboprop	29	12	16	22
Jet	79	93	118	153
Helicopter	15	16	19	23
Total	340	350	376	447
Note: 1. The 2012 based aircraft totals are combined for Single Engine Turboprop, Multi Engine Piston and Multi-Engine Turboprop. In 2012 there were 29 based aircraft for these three types combined. Source: 2012 <i>ESPR</i> , Massport for 2017 numbers, and InterVISTAS for forecast years.				

3.5 Summary of Changes in Airport Activity Levels

In conclusion, GA operations at Hanscom and the nation are down and are still recovering from the global recession of 2008/09. However, looking to the future, GA operations for the nation and Hanscom Field are forecast to grow. The main source of this growth will be in business operations largely those operations occurring in Turbo and Jet aircraft. Hanscom Field could also experience a return of scheduled commercial airline service.

4

Airport Planning



Massport's primary responsibility at Laurence G. Hanscom Field (Hanscom Field) is to maintain a safe, secure, and efficient regional General Aviation airport while minimizing the environmental impact of its operations. Planning is critical to ensure that an airport's facilities will continue to be safe and secure while accommodating future operating conditions. Proper planning also allows Massport to manage development in a fiscally and environmentally responsible manner. The Hanscom Field Environmental Status & Planning Report (ESPR) addresses potential development needs to address the forecasted future activity levels.

This chapter focuses on the development and planning framework for Hanscom Field, as well as the plan's alignment with Federal Aviation Administration (FAA) guidance and

requirements, and local and regional planning activities. This chapter presents potential physical and operational conditions consistent with the 2025 and 2035 activity forecast scenarios described in Chapter 3 Airport Activity Levels, and baseline conditions and needs described in Chapter 2 Facilities and Infrastructure.

The 1978 Hanscom Field Master Plan and Environmental Impact Statement (Master Plan) and Massport's 1980 regulations, which establish the general planning framework for Hanscom Field, informed forecasts and planning assumptions presented in this ESPR. Massport has consulted with the FAA on the future development scenarios documented herein, and will continue to do so, as part of the Airport Layout Plan (ALP) approval process, to ensure all federal requirements are met.

For context, this chapter describes the key aspects of the Master Plan and the 1980 regulations, as well as other planning criteria, including federal, state and local regulations and guidance. The forecasts are projections of what might occur with respect to future demand assumptions that may or may not come to fruition.

Further, the planning for potential development associated with the forecast may be advanced as demand warrants their implementation.

This ESPR also evaluates the near-term Massport projects as well as the potential development associated with the demand projected through 2035 for their consistency with applicable local and regional planning.

4.1 Airport Planning Context

Massport regularly assesses the changing dynamics of the aviation industry, including shifts in the general aviation (GA) demand profile from private flying and business jets, and the evolution of airport security needs due to Transportation Security Administration (TSA)-issued security directives. Furthermore, legislative and regulatory mandates inform and affect airports' near- and long-term planning efforts.

Scenario-based planning approach:

Massport has employed a scenario-based approach to plan for the future of the Airport. The projects presented here are based on aviation demand forecasts that are subject to changes in economic growth and development. Accordingly, projects will be implemented as demand warrants.

Massport is committed to ensuring that planning and development at Hanscom Field is consistent with these mandates and in compliance with federal and state laws affecting the airport. Massport acknowledges the importance of managing Hanscom Field in an environmentally sensitive and sustainable manner that recognizes the significance of the Minute Man National Historical Park (MMNHP), Great Meadows National Wildlife

Refuge (GMNWR), Hanscom Air Force Base (AFB), and the towns of Bedford, Concord, Lexington, and Lincoln (Chapter 11 Sustainability and Environmental Management, discusses Massport's approach to sustainable practices as part of the agency's general operating and development philosophy). The following sections describe local and regional planning initiatives, including overviews of the comprehensive plans of the four towns, and information gathered through discussions with local officials and the National Park Service (NPS) as part of the process to prepare the 2017 *ESPR*.

Massport has developed the planning concepts evaluated in this 2017 *ESPR* within the framework of the 1978 Master Plan and Massport's 1980 regulations. Massport also considers the following when formulating the plan for the future development of the Airport:

- ⇒ FAA Advisory Circular 150/5070-6b, *Airport Master Plans*;³¹
- ⇒ FAA Advisory Circular 150/5300-13, *Airport Design*;³²
- ⇒ FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*;³³
- ⇒ FAA Terminal Area Forecast for the airport;
- ⇒ Federal, state, and local environmental regulatory requirements and review processes;

³¹ FAA. January 27, 2015. Advisory Circular 150/5070-6b Change 2.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_150_5070-6B_with_chg_1&2.pdf

³² FAA. February 26, 2014. Advisory Circular 150/5300-13 Change 1.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5300-13A-chg1-interactive-201804.pdf

³³ FAA Advisory Circular 150/5325-4B. July 1, 2005.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_150_5325-4B.pdf

- ⇒ Executive Order 385, *Planning for Growth*³⁴, which is the Growth Management Policy for Massachusetts;
- ⇒ Executive Order 438, *State Sustainability Program*³⁵, which initiated the new State Sustainability Program;
- ⇒ Regional planning framework;
- ⇒ Local comprehensive and growth management plans; and
- ⇒ Long-range plans for the Minute Man National Historical Park (MMNHP) and Hanscom AFB.

This approach provides a planning context for potential improvements at the airport.

4.1.1 Airport Plans and Regulations

In 1978, Massport issued the *Hanscom Field Master Plan and Environmental Impact Statement*. In response to community concerns that arose when Massport became responsible for the operation of Hanscom Field in 1974, Massport drafted a number of policies in the Master Plan that still guide Massport's management of and planning for Hanscom Field. The adoption of the *Massport Regulations and Noise Rule* in 1980 was an outgrowth of the Master Plan.

In 1978, the Master Plan described aviation-related development on lands dedicated to aviation-related uses on U.S. Air Force (USAF) land that later changed ownership to Massport. Other development, according to the Master Plan, would be compatible with existing, adjacent land uses and airport operations. These policies and regulations have guided Massport's development of the 2017 *ESPR*, which reaffirms the role of Hanscom Field as a premier regional general aviation airport.

Massport Regulations and Noise Rules contain the following provisions:

- 1) Limit scheduled commercial airline service to passenger aircraft with 60 seats or less;
- 2) Impose a nighttime field use fee to discourage activity between 11:00 PM and 7:00 AM;
- 3) Prohibit touch-and-go operations between the hours of 11:00 PM and 7:00 AM;
- 4) Prohibit touch and go operations at any time by aircraft exceeding 12,500 pounds; and
- 5) Limit Auxiliary Power Unit (APU) and Ground Power Unit (GPU) usage to 30 minutes, with further limitations between the hours of 11:00 PM and 7:00 AM.

³⁴ Commonwealth of Massachusetts. April 23, 1996. *Executive Order 385: Planning for Growth*. <https://www.mass.gov/executive-orders/no-385-planning-for-growth>

³⁵ Commonwealth of Massachusetts. July 23, 2002. *Executive Order 438: State Sustainability Program*. <https://www.mass.gov/executive-orders/no-438-state-sustainability-program>

4.1.2 Overview of the Aviation Forecast

The forecasts for aviation activity at Hanscom Field in this ESPR include projections of aircraft operations and based aircraft for the near-term (2025) and the long-term (2035). The forecasts assume that Hanscom Field continues to act as a GA reliever for Logan Airport, and as the premier business aviation airport for the Greater Boston area. The forecast also assumes that military operations will remain limited. In addition, the 2025 forecast assumes that the airport could again offer scheduled commercial airline operations. The operations forecast is based on historical trends at Hanscom Field along with national trends for GA. The forecast also takes economic projections into consideration, given the well-documented relationship between the economy and GA activity. The forecast update for Hanscom Field is presented in Table 4-1.

Notably, the forecast for 2035, which projects just under 139,000 annual aircraft operations, is considerably lower than the 2012 ESPR forecast for the year 2030 at nearly 193,000 operations.³⁶ The reduced demand is primarily due to changes in the market, specifically changes within the single engine piston market segment comprised of training and personal flying. This forecast drives the planning for future development discussed in Section 4.2.

Table 4-1 Forecast of Operations at Hanscom Field

Activity	Actual		Forecast		Compound Annual Growth			
	2012	2017	2025	2035	2012-17	2017-25	2025-35	2017-35
Training (SEP)	70,196	46,014	41,795	40,723	-8.1%	-1.2%	-0.3%	-0.7%
Personal Flying (SEP)	51,477	33,040	29,208	28,252	-8.5%	-1.5%	-0.3%	-0.9%
Business MEP	3,763	3,015	2,907	2,879	-4.3%	-0.5%	-0.1%	-0.3%
Business Turbo	6,415	7,831	10,189	12,205	4.1%	3.3%	1.8%	2.5%
Business Jet	25,638	29,862	36,515	41,907	3.1%	2.5%	1.4%	1.9%
Helicopter	7,345	8,256	9,522	10,332	2.4%	1.8%	0.8%	1.3%
Military	745	759	759	759	0.4%	0.0%	0.0%	0.0%
Scheduled Commercial Airline	635	0	1,019	1,783	-100.0%	N/A	5.8%	N/A
Total	166,214	128,777	131,913	138,841	-5.0%	0.3%	0.5%	0.4%

³⁶ Daytime operations between 7:00 AM and 11:00 PM, the hours that the FAA Air Traffic Control Tower is open.

4.1.3 Investments in Safety, Equipment, and Facilities Between 2012 and 2017

Hanscom Field is the region's leading full-service general aviation airport and it plays a critical role in New England's regional aviation system as a corporate reliever for Logan International Airport. In order to maintain this role, Massport continues to invest in important safety and efficiency projects that improve operations and management of the airfield. As part of this effort, several airport facility improvements, initiatives, and studies have occurred since the 2012 *ESPR*. Like most airports, much of the investment over the last five years, involve maintenance of the airfield pavements to ensure that they remain in good operating condition. More specifically, Massport continues its airfield maintenance and improvement program by rehabilitating several areas, including the pavement on Runway 11/29. The Runway 11/29 project occurred in 2017, and it required a month-long closure of the runway, as well as weekend closure of the airport. Other recent pavement rehabilitation included the T-hangar areas, Taxiway J, and Taxiway G.

As part of its commitment to safe operations, Massport continues to identify and remove vegetation that penetrates, or is close to penetrating FAA runway approach and departure surfaces, based on Hanscom's Five Year 2014-2018 Vegetation Plan (VMP) and following state guidelines (The VMP is updated every five years). Further, Massport has enhanced airport safety by standardizing Airport Rescue and Fire Fighting (ARFF) operations across Massport-owned airports to leverage resources across the state. Massport fire-rescue began operations at Hanscom Field in 2015 and plans to move into a new state-of-the-art facility in 2019.

Facility improvements included upgrading electrical and fire protection infrastructure at various locations across the airfield, and evaluating the drainage system and flooding issues associated with the Civil Air Terminal in order to continue to maintain an effective stormwater management plan. In Fiscal Year 2017 (FY2017), Massport invested \$4.3 million in airfield, terminal, equipment and other facility improvements required to ensure the safe and efficient operation of the airport.³⁷ In addition, in 2018 Massport began construction on a new ARFF and U.S. Customs and Border Protection (CBP) building (designed to LEED Gold standards), which will accommodate an increase in fire rescue staffing. In this *ESPR*, Massport has updated the primary planning areas considered in the 2012 *ESPR* to reflect changes in aircraft mix, infrastructure issues, and the latest aviation activity forecast discussed in Chapter 3 Airport Activity Levels.

4.1.4 Airport Layout Plan

The Federal Aviation Administration (FAA) defines the Airport Layout Plan (ALP) as a set of scaled drawings depicting existing and potential future airport facilities and property. The ALP enables the airport operator to seek federal funding for certain improvements, provide

³⁷ Massport. April 2018. *The State of Hanscom, 2017*.

information for environmental review of the same, and enable FAA and airport management to make prudent decisions regarding near-term projects consistent with the overall plan for the airport. Appendix B presents the 2017 ALP for Hanscom Field, which reflects the planning conducted since the FAA approved the previous ALP update in 2011.

The 2017 ALP reflects planning improvements discussed in the 2005 and 2012 *ESPRs*. The ALP described here offers a graphic representation of the existing conditions at Hanscom Field, potential development projects, the protected airspace as defined by FAA Part 77 regulations³⁸, and the existing land use in and around Hanscom Field. The ALP is prepared in compliance with FAA standards, including those outlined in Advisory Circular 150/5070-6b, *Airport Master Plans, Change 2*, and Chapter 10.³⁹ The ALP indicates areas that might be suitable for future aviation-related or

compatible aviation land uses, as well as buildings that might be suitable for future aviation-related facilities. Specifically, areas shown as potential locations for future aviation-related use include the North Airfield, West Ramp (which encompasses the terminal area and Airport Traffic Control Tower), the East Ramp, and Pine Hill.

According to the Existing Land Use sheet in the ALP, the majority of land use at Hanscom is designated as Transportation. A small percentage of land within the Runway Protection Zones (RPZs) is designated as Open Land, Wetlands, Agriculture, and Forest. The ALP is considered a living document, and it evolves on a routine basis to accurately represent existing conditions and potential future development.

Massport has identified the need for further study of the airfield, which would address airfield standards for design, airfield geometry, and runway incursion mitigation in accordance with FAA Advisory Circular (AC), 150/5300-13A, *Airport Design*.⁴⁰ Pursuant to the airfield study, Massport will update the 2017 ALP by late 2019 or early 2020.

Planning considerations that could be addressed as conditions warrant include:

- ⇒ Airfield capacity, in accordance with FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*;
- ⇒ Runway length requirements, in accordance with FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*; and
- ⇒ Airport development beyond that considered at present in future updates to the Airport Layout Plan in accordance with FAA Advisory Circular 150-507-6B, *Airport Master Plans*.

³⁸ Title 14 C.F.R. §77 - Safe, Efficient Use, and Preservation of the Navigable Airspace. July 21, 2010.

³⁹ FAA. January 27, 2015. Advisory Circular 150/5070-6b Change 2.

https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5070-6B-Change-2-Consolidated.pdf

⁴⁰ Massport, along with close coordination with FAA, has planned a near-term study of airfield geometry with the goal of mitigating the risk of runway incursions.

4.1.5 Procedures for New Airline Tenants

Scheduled commercial passenger service continues to be only a small component of Hanscom Field's future forecasted aviation activity. An airline must follow FAA and Massport procedures to commence scheduled services at Hanscom, including adhering to the limitations described in Section 4.1.1. The forecast for scheduled commercial air travel at Hanscom Field is discussed in Chapter 3 Airport Activity Levels and is incorporated into the airport planning process. Notably, no new passenger facilities would be required to meet the forecast for potential scheduled commercial activity in the future, given the prohibition of passenger aircraft with more than 60 seats.⁴¹

⁴¹ Massport. 1980. *General Rules and Regulations for Laurence G. Hanscom Field*. <http://www.massport.com/hanscom-field/about-hanscom/airport-activity-monitor/hanscom-rules-regulations/>

4.1.6 Environmental Planning

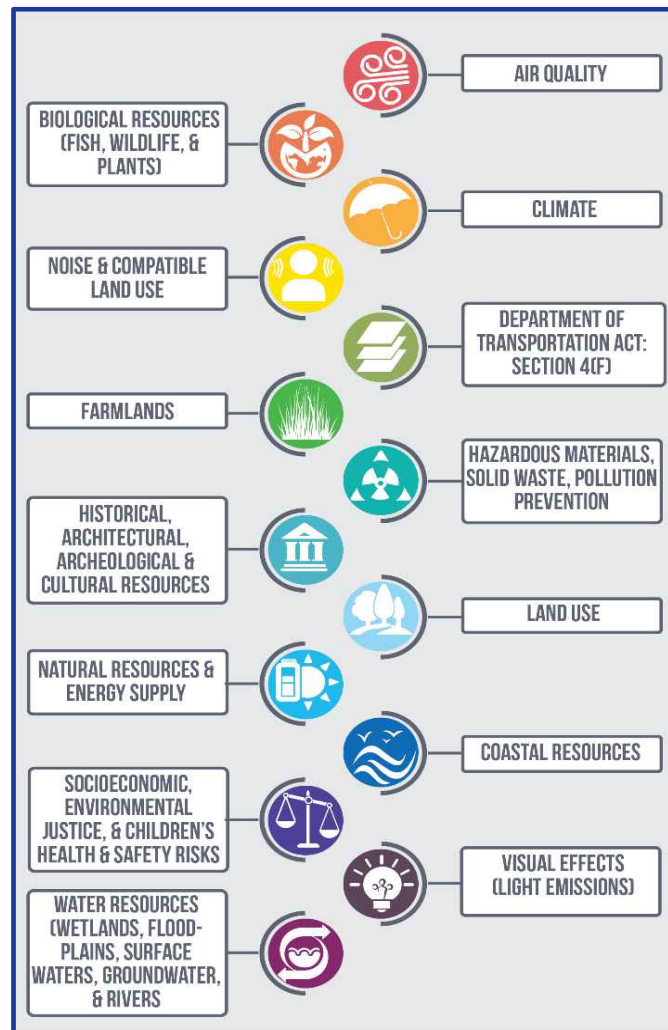
Massport has developed the 2017 *ESPR* primarily for review under the Massachusetts Environmental Policy Act (MEPA). However, the document is utilized in a broader context. For example, potential future development documented within the *ESPR* may be subject to further environmental review under the National Environmental Policy Act (NEPA) prior to a project being implemented as identified in Section 4.2.5 (see Figure 4-1 for environmental impact categories analyzed under NEPA). Further, the FAA could review future development and determine that additional analysis is required beyond that indicated herein and that a Categorical Exclusion, Environmental Assessment (EA) or Environmental Impact Statement (EIS) is warranted, depending on the nature and anticipated impacts of the proposed action(s). In addition, Massport coordinates with FAA on ALP changes to reflect future development as mentioned in Section 4.1.4 of this chapter.

Massport collaborated with the FAA during the preparation of this *ESPR* regarding future plans for the airport and the forecast of aviation demand, and

Massport is committed to working with the FAA on an ongoing basis to conduct the necessary environmental reviews. Table 4-9 provides the likely level of environmental review required for the projects described herein.

In addition to the role that the FAA plays in the environmental review process for airport projects, it also requires air service operators to meet specific safety requirements. Massport requires that air service operators obtain FAA approval as well as all applicable state approvals prior to initiating scheduled commercial passenger service on the airport. Further, Massport does not allow any new air service operator to begin service until it has secured all necessary environmental approvals. FAA Orders 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA 2015), and 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions*

Figure 4-1 Impacts Analyzed in Environmental Review for Compliance with NEPA (FAA Orders 1050.1F, 5050.4B)



for Airport Actions (FAA 2006), provide instructions and guidelines for preparing and processing NEPA documents for airport development proposals and other airport actions as required by law.^{42, 43}

In accordance with FAA regulations, some projects may be “categorically excluded” from additional environmental review due to minimal potential for adverse environmental impact (commonly referred to as a CatEx). Examples of projects that may be categorically excluded include: acquiring security equipment that is required for the safety of security personnel and property on the airport, or safety equipment required by rule or regulation for the certification of an airport. The specific action being requested determines the type of environmental processing required by the FAA. In the event that a project is not categorically excluded from environmental review, the potential environmental consequences associated with a proposed action would be assessed as determined by the FAA. Such environmental review, as specified in the aforementioned FAA Orders 1050.1F and 5050.4B, includes an analysis of the impacts in Figure 4-1. Some of these categories, such as impacts to coastal resources, would not apply to an action at Hanscom Field.

There is potential that some projects included in this ESPR could require development proximate to wetland areas, particularly those within the West Ramp and North Airfield. Massport is committed to minimizing environmental impacts and would avoid these impacts to the maximum extent practicable, and fully mitigate any unavoidable impacts. None of the projects considered would require filling of wetlands, which would require permits from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and the Massachusetts Department of Environmental Protection under the Massachusetts Wetlands Protection Act and Section 401 of the Clean Water Act.

The Vegetation Management Plan (VMP) provides Massport with a methodology to remove vegetation in order to maintain aviation safety while complying with various local, state, and federal regulations. Vegetation removal projects take place at Hanscom Field approximately every five years. The vegetation removal involves several steps. Aerial photography and other imaging techniques are used to collect information identifying where trees and other structures penetrate protected airspace. The protected airspace is determined from runway approach categories defined by the FAA. Once the analysis is complete, the penetrating vegetation can be removed following environmental constraints, based on several documents, such as the Vegetation Generic Environmental Impact Report (GEIR) and the Massachusetts Wetlands Protection Act regulations. Further details about the VMP are discussed in Chapter 9.

4.1.7 Local Municipality Planning Initiatives

Hanscom Field is located within the towns of Bedford, Concord, Lexington, and Lincoln; which are suburban communities of metropolitan Boston with strong economic ties to the high-tech

⁴² FAA. July 16, 2015. Order 1050.1f. https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf

⁴³ FAA. April 28, 2006. Order 5050.4B. https://www.faa.gov/airports/resources/publications/orders/environmental_5050_4/

and service economies that are located along Route 128/Interstate 95. The four towns have undergone significant changes since 1970 when Hanscom Field accommodated over 300,000 operations (landings and takeoffs) per year. The combined population of the four towns remained steady between 1970 and 2007 but has seen a 0.7 percent compound annual growth rate (CAGR)⁴⁴ in the last ten years, as described in Table 4-2. Lexington has seen the greatest annual population growth of 1.1 percent, while Lincoln's population has decreased at an annual rate of 1.9 percent.

Table 4-2 Population Trends in Bedford, Concord, Lexington, and Lincoln

Town	1970	2007	2017	Compound Annual Growth Rate - CAGR (1970-2007)	Compound Annual Growth Rate - CAGR (2007-2017)
Bedford	13,513	13,074	14,197	-0.1%	+0.8%
Concord	16,148	17,712	19,237	+0.3%	+0.8%
Lexington	31,886	30,109	33,727	-0.2%	+1.1%
Lincoln	7,567	8,206	6,781	+0.2%	-1.9%
TOTAL	69,114	69,101	73,942	0.0%	+0.7%

Source: U.S. Census Data, 1970, 2007, and 2017

The Metropolitan Area Planning Council (MAPC) studied population projections in 2014 and considered a low and a high growth rate scenario for the Metro Boston area, based on population counts taken in 2010 (Decennial Census data).⁴⁵ As shown in Table 4-3, the 2017 cumulative population of the four towns has already reached the projected population under the high economic growth scenario for the year 2030 (MAPC projections are only provided for 2020 and 2030). Bedford's population in 2017 approximately matched the 2020 projected level, while Concord's population has surpassed the 2030 projection. Lexington's 2017 population is also near the 2030 projection, while Lincoln's is already higher. As the current population numbers indicate, the future population in the four towns will likely increase at a rate higher than projected by the MAPC in 2014. In the fall of 2018, MAPC launched a two-year planning process to update Greater Boston's regional plan. The UMASS Donahue Institute also continuously studies population projections in the state. The population estimates presented in Table 4-3 for 2025 and 2035 are based on 2010 U.S. Census Data reconciled to 2014 state population numbers. In these UMASS estimates, the 2025 projected population for the four towns is higher than the MAPC projection for 2030. The 2017 population for Concord has already exceeded the 2035 projection, but the other three towns' population trends are closer to the UMASS projections.

⁴⁴ The compound annual growth rate (CAGR) calculates a constant rate of growth for each year over the time period.

⁴⁵ Metropolitan Area Planning Council (MAPC): Population and Housing Demand Projections for Metro Boston, 2014

Table 4-3 Population Projections for Bedford, Concord, Lexington, and Lincoln

Town	2017 (Actual)	Metropolitan Area Planning Council (2014 Projection)		UMASS Donahue Institute (2015 Projection)	
		2020	2030	2025	2035
Bedford	14,197	14,157	15,329	15,248	16,458
Concord	19,237	17,878	18,354	18,166	18,022
Lexington	33,727	32,359	33,908	34,293	36,943
Lincoln	6,781	6,090	5,949	10,033	10,400
TOTAL	73,942	70,484	73,540	77,740	81,823

Source: U.S. Census Data - 2017, MAPC Population and Housing Demand Projection (data shown for 2020 and 2030 Stronger Region Scenario); UMASS Donahue Institute, updated March 2015

The MAPC forecast indicates that the number of housing units of the four towns will increase to 29,195 by 2020 and to 31,608 by 2030, as shown in Table 4-4. Based on actual housing data for 2017 obtained from the American Community Survey, the 2020 projection would require an average annual growth rate of 2.2% and the 2030 projection would require an average annual growth rate of 1.1%. The fastest growth is projected to occur in the Town of Bedford, and the slowest growth is projected in the Town of Lincoln.

Table 4-4 Housing Unit Projections for Bedford, Concord, Lexington, and Lincoln

Housing Units	2017 (Actual)	2020 (2014 Projection)	2030 (2014 Projection)
Bedford	5,260	5,959	6,612
Concord	7,327	7,559	8,143
Lexington	12,161	13,068	14,184
Lincoln	2,564	2,609	2,669
TOTAL	27,312	29,195	31,608

Source: American Community Survey - 2017, MAPC projection for 2020 and 2030 for Stronger Region Scenario - 2014

Bedford

The Town of Bedford approved a comprehensive plan in 2014.⁴⁶ The plan includes six key areas: land use; natural and cultural resources; economic development; transportation; housing needs; and services, facilities, recreation and energy. According to the plan, the town-controlled inventory of open space expanded by more than 200 acres since 2002, and hundreds of new dwelling units have been added. Approximately 95 percent of Bedford's area is developed land. Hanscom Field occupies approximately 645 acres in the Town of Bedford, including the areas on airport referred to as the North Airfield and East Ramp which are shown in Figure 4-2. The

⁴⁶ Bedford Planning Board. December 2013. *The Bedford We Want: Shaping Our Future, Comprehensive Plan*

U.S. Navy hangar located in Bedford on the North Airfield, was recently sold at public auction administered by the General Services Administration (GSA). New residential development projects have taken place on the northeast side of Hanscom Field, near Summer Street and South Road, and new residential, industrial, and retail projects have been added on the northwest side of Hanscom Field, near Hartwell Road. Additionally, the Route 3 corridor continues to feature new large-footprint developments with close proximity to the Airport. These new developments, paired with growing population, are contributing to road congestion.⁴⁷ Bedford's major job centers and corridors are highly automobile dependent, resulting in heavy traffic volumes during commute hours. Hanscom Field-related traffic is considered a minimal contributor to traffic volumes on Bedford roadways. See Chapter 6 for more information about traffic volumes.

Massport works through the Bedford Conservation Commission to address projects in or adjacent to regulated wetlands, such as the ongoing *Vegetation Management Plan* (VMP). In past years, Massport implemented multiple phases of the VMP in accordance with Bedford's and other Hanscom town Orders of Condition.⁴⁸ Phase I of the VMP was prepared in 2002 to guide the maintenance of protected airspace at Hanscom Field. The VMP was designed to serve as a guide for future airfield vegetation removal. An update to this VMP was published in 2008, titled *Hanscom Field 2009-2013 Vegetation Management Plan November 2008 Update*. The update included lessons learned from previous removal projects and associated maintenance projects implemented between 2003 and 2007. Massport submitted copies of the updated VMP to the four towns' conservation commissions as part of the permitting process that was completed in 2009.

The updated VMP identified obstructions in Bedford's Jordan Conservation Area (JCA). In 2010, the Bedford Conservation Commissions, Massport, and the Bedford Selectmen signed a Memorandum of Agreement (MOA) that allows Massport to periodically access the JCA for future vegetation management projects, subject to the Commission's review under the state's Wetlands Protection Act. As part of the MOA, Massport worked with Bedford to develop access to a trail system on Massport-owned parcels.

The Town of Bedford has also completed topic specific plans and studies subsequent to the 2014 Comprehensive Plan, which include the Pedestrian and Bicycle Master Plan in 2015, the Great Road Business District Assessment in 2016, and a brand-new Bedford Housing Study.

Concord

The Town of Concord adopted its comprehensive long-range plan, *Envision Concord*, in 2018.⁴⁹ The comprehensive plan includes analysis of historic resources, economic resources, housing,

⁴⁷ Metropolitan Area Planning Council (MAPC). 2013. *Burlington/Bedford Commuter Transit Analysis*.

⁴⁸ Massport. *The State of Hanscom, 2017 and 2018*.

⁴⁹ Town of Concord. July 2018. *Envision Concord – Bridge to 2030: Balancing Change with Tradition*.

land use and zoning, mobility and transportation, open space and natural resources, public facilities and infrastructure, and fiscal planning.

The Town aims to protect scenic quality and historical significance, as well as the rural character of its roads, such as Virginia Road (near the Pine Hill area). The report states that roadway congestion has increased in recent years due in part to increased use of navigational tools by commuters. Additionally, several federal offices are planning to relocate to Hanscom AFB. Among them, the U.S. Army Corps of Engineers (with 350 employees) is relocating from Virginia Road in Concord beginning in 2019.⁵⁰ To reduce automobile traffic, the town is exploring multi-modal transportation opportunities, particularly from transit hubs to work destinations. Discussions are ongoing with Hanscom AFB and other partners to develop shuttle service for first-mile/last-mile commute from Concord's train stations to work destinations.

Hanscom Field occupies 385 acres of land in Concord, about 2.3 percent of all land, including the areas referred to as Pine Hill, shown in Figure 4-2. Massport has worked through the applicable local processes to address environmental considerations in Concord, such as the VMP. Since the publication of the first VMP, Massport has conducted vegetation removal projects in accordance with Concord's Order of Conditions.

Lexington

The Town of Lexington is in the process of updating its comprehensive plan. This will be the first update since the publication of its *2003 Comprehensive Plan*.⁵¹ An advisory board has been appointed to oversee the work, in consultation with Town staff and the Planning Board. As part of the planning process, the Town has already facilitated small group conversations with the public and presented updates on the Comprehensive Plan regarding demographics and housing trends. Additional sessions are planned on transportation and economic development. The new Comprehensive Plan is expected to take a few years to complete.

Given its proximity to Hanscom Field and the AFB relative to Metropolitan Boston, the Town of Lexington is focused on potential transportation impacts of Hanscom and works with Massport to attempt to mitigate impacts from proposed development and air travel, and to improve vehicle traffic safety at intersections that are high-accident locations. Lexington is currently reviewing its zoning in the manufacturing district at the end of Hartwell Avenue, on the east side of Hanscom Field.⁵² Re-zoning of this area would allow for the development for higher density small-scale residential units, which could impact road traffic in the area. Hanscom Field occupies approximately one acre of land in Lexington. In Lexington, Massport has worked through the applicable local processes to address environmental issues. For example, Massport has implemented the VMP in accordance with Lexington's Order of Conditions.

⁵⁰ Hanscom Area Towns Selectmen. Minutes from July 27, 2017 Meeting.

⁵¹ Town of Lexington. *2003 Comprehensive Plan: The Lexington We Want 2002-2003*.

⁵² Town of Lexington. Board of Selectman Meeting, 2017.

A relatively small area of land off the eastern end of Runway 11/29 is located within the Town of Lexington.

Lincoln

Lincoln is the smallest of the four Hanscom area towns in terms of population and economic base. Hanscom AFB and Hanscom Field comprise approximately 8.2 percent of Lincoln's land area, at approximately 544 and 241 acres, respectively. The passenger terminal area located within the area referred to as the West Ramp including the areas shown in Figure 4-2 comprises most of the land within the town of Lincoln on the airport.

The Town of Lincoln last published its comprehensive plan in 2009, with a second printing in 2010.⁵³ The plan presents issues, goals, and recommendations pertaining to the following sections: land use and zoning, natural resources, cultural and historic resources, the built environment, open space, housing, economic development, transportation and circulation, community services and facilities, and governance.

In Lincoln, Massport has worked through the applicable local processes to address environmental issues, such as the Order of Conditions on the VMP.

Hanscom Area Towns Committee Master Plan

The four towns surrounding Hanscom (Bedford, Concord, Lexington, and Lincoln) established the Hanscom Area Towns Committee (HATS) to review activities that involve Hanscom AFB, Hanscom Field and other major organizations that operate in the Hanscom Field area. These organizations include the U.S. Air Force, the NPS, Massport, Lincoln Laboratories, and other private corporations. Through HATS, the four towns coordinate their planning efforts, growth projections, land use plans, and environment protection roles. HATS prepared a Master Plan in July 1997, soon after the completion of the *1995 Generic Environmental Impact Report* (GEIR).⁵⁴ The Hanscom Field *ESPR* considers the *HATS Master Plan* as it applies to Hanscom Field.

Massport takes a comprehensive approach to managing airfield operations at Hanscom Field and protecting natural resources. Massport has implemented many recommendations of the Hanscom Noise Workgroup (a working group comprised of interested, knowledgeable members of the communities surrounding Hanscom Field), and is exploring Transportation Demand Management (TDM) strategies. Rideshare programs and other alternative transportation modes at Hanscom Field are challenging to implement due to the nature of work at the airport and employees working non-traditional hours (more details on TDM are described in Chapter 6). Massport has also periodically met with NPS to discuss issues of concern and to identify historic resources as described in Chapter 10 Cultural and Historical Resources.

⁵³ Town of Lincoln. 2009. Comprehensive Plan.

⁵⁴ Hanscom Area Towns Committee. July 1997. Hanscom Area Towns (HATS) Master Plan.

Similar to the 2012 *ESPR*, the future planning scenarios in the 2017 *ESPR* describe potential additional aviation and aviation-related uses on the airport and retain many areas in their current, natural state.

4.1.8 Stakeholder Planning Initiatives

In addition to the associated municipalities, Hanscom Field also has three key stakeholders who are central partners to Massport and the future of Hanscom Field: the FAA, MMNHP, and Hanscom AFB. Both the MMNHP and Hanscom AFB are located immediately adjacent to Hanscom Field. Activities proposed on the airfield and on their properties can have a direct impact on one another. As a result, Massport engages with the NPS and the USAF periodically to discuss mutually beneficial projects to improve each organization in accordance with their mission.

Federal Aviation Administration

Hanscom Field is under the purview of the FAA's New England Region whose regional office is located in Burlington, Massachusetts. The FAA participates as a stakeholder and is a central partner to Massport.

The FAA administers the Airports Improvement Program (AIP) that provides grants for planning and development projects, funded through user fees and fuel taxes. The FAA is also the operator of the ramp, ground, local, and departure/arrival air traffic through providing air traffic control and navigation services. Lastly, the FAA is the regulator of the airport and airspace system to ensure safe and efficient operations at public-use airports, including Hanscom Field.

Further, operational and infrastructure improvements require the FAA's review, as the lead agency responsible for compliance with NEPA regulations. The FAA aims to ensure timely and effective environmental reviews of proposed projects at Hanscom Field.

Minute Man National Historical Park

The MMNHP, created in 1959 and operated by the NPS, consists of three discontinuous parcels: Battle Road, Wayside, and North Bridge. This park covers approximately 967 acres spread out along Route 2A in Concord, Lexington, and Lincoln. The congressionally-approved boundaries of the MMNHP abut the southern boundary of Hanscom Field and include 48.5 acres of Massport property in the Runway 5 approach area.

The MMNHP is nationally significant as the site of the Battle of Concord, one of the first battles of the Revolutionary War, for its association with prominent literary figures of the 19th and 20th centuries, and as one of the earliest places in the nation to be commemorated.

The NPS reports that over a million people visited the MMNHP in 2016, the NPS's centennial year, and it anticipates that annual visitations will continue at current levels.⁵⁵ While the Park is open year-round, its main season is the 7-month period between April and October. Major attractions are the North Bridge area in Concord and Battle Road in Concord, Lexington, and Lincoln. Two parking lots at the North Bridge unit and one at the Visitor Center in the Battle Road unit accommodate automobile and bus parking; six other parking lots are located in the Park. Chapter 10 Cultural and Historical Resources provides additional information about the MMNHP.

The preservation of Battle Road, which makes up 80 percent of the Park, is of particular importance to the NPS. The potential impacts of transportation activity from Hanscom and Route 2A are important issues for the NPS. Working cooperatively with the local community, aviation groups and MMHNP, Massport has developed a noise abatement program for business, commercial, flight school and private aircraft. The implementation of 'Fly Friendly' flight pattern keeps aircraft closer to the airfield rather than over sensitive park areas. Prior to this initiative, most touch-and-go operations on Runways 11/29 and 5/23 circled to the south of the Airport, over areas of the Battle Road Trail that are used for outdoor programs and interpretive talks. In a partnership involving coordination with the NPS, the FAA, the flight schools, and the pilots at Hanscom, it was determined that small aircraft could reduce the flight pattern in touch-and-go operations that would provide a larger buffer between training operations and the Park. Additionally, Massport also developed recommended helicopter procedures to help reduce noise over the Park.

Other noise reduction efforts include regulations that prohibit touch-and-go activity between 11:00 PM and 7:00 AM. and touch-and-go activity for aircraft weighing over 12,500 pounds. There is also a fee for operations between 11:00 PM and 7:00 AM. In 2012, Congress passed the *FAA Modernization and Reform Act*⁵⁶, which included the phase out of all non-Stage 3 aircraft by the end of 2015. Review of airport use in the Hanscom Field 2016 Annual Noise Report determined that all civilian jets utilizing Hanscom Field have been modified to meet Stage 3 noise level requirements.⁵⁷

Hanscom Field Advisory Commission

Massport meets with the Hanscom Field Advisory Commission (HFAC) monthly at the Civil Air Terminal to review activities at Hanscom Field. HFAC is an advisory committee that was established by the state legislature in 1980. It includes representatives from residential communities (Bedford, Concord, Lexington, Lincoln, and other towns in the area affected by Hanscom Field), business and general aviation groups, advisory members who represent

⁵⁵ National Park Service. March 21, 2017. *Over One Million visit Minute Man National Historical Park in 2016*.

<https://www.nps.gov/mima/learn/news/over-one-million-visit-minute-man-national-historical-park-in-2016.htm>,

⁵⁶ Public Law 112-95: FAA Modernization and Reform Act of 2012. 126 Stat. 11; Date 2/14/2012. Text from United States Public Laws. Accessed November 1, 2018 at <https://www.congress.gov/112/plaws/publ95/PLAW-112publ95.pdf>

⁵⁷ Massport. November 2017. *Hanscom Field 2016 Annual Noise Report*. <http://www.massport.com/media/2632/2016-annual-noise-report.pdf>

MMNHP, Hanscom AFB, the FAA, and Massport (the meetings are open to the residents of surrounding towns as well). Massport provides HFAC with information regarding Massport's goals, policies, and plans for its facilities in the future. Massport also reports on monthly and annual operations and noise statistics. The HFAC process affords the community the opportunity to review and comment on projects that are not subject to formal Massachusetts Environmental Policy Act (MEPA), or NEPA, review. Further, it provides the public an opportunity to comment on proposed projects and issues related to Hanscom operations.

Hanscom Air Force Base

Hanscom AFB, which is directly adjacent to Hanscom Field on the southern side of the airfield, occupies 846 acres of land with 4.1 million square feet of facilities. Hanscom AFB and the firms that do business at the base are important employers in the region. Over 10,000 employees work at the Base, which includes active duty, National Guard, civilian, contractor, and MIT Lincoln Laboratory personnel. There are also 731 homes on the Base, most occupied by Air Force personnel. Additionally, Hanscom AFB supports approximately 130,000 retired military personnel, annuitants and spouses living in the six-state New England area and New York area. According to information published by the Hanscom AFB, as of April 2018, the total estimated economic impact is approximately \$6.03 billion per year.⁵⁸ Primary Hanscom jobs total 10,015 (including MIT Lincoln Laboratory), and secondary jobs total 10,050.

The USAF is spending about \$225 million on construction at the Base and on two new buildings for the MIT Lincoln Laboratory. The USAF is constructing a new dormitory and renovating several other buildings. These renovations and investments will provide offices for 675 personnel who will commute to the Base once the construction ends; of these, 325 currently work in Boston and 350 currently work in Concord.

Construction of a relocated Vandenberg Gate, newly renamed as the Sartain Gate, commenced in 2018 and is ongoing. The USAF has been working with Massport and the Massachusetts Department of Transportation (MassDOT) on the design of the new gate structure and entrance facility that is planned to replace the one at the intersection of Old Bedford Road, Vandenberg Drive, and Hanscom Drive with a roundabout.⁵⁹ Along with the improvements to the roadways, a bicycle lane is also included in the design to increase safety of cyclists. As a result of traffic changes, the MBTA bus stop will also be relocated onto AFB property.

Metropolitan Area Planning Council Regional Plan

The MAPC is the regional planning agency for metropolitan Boston, representing 101 cities and towns. MAPC encourages sustainable development practices. The primary areas of focus

⁵⁸ Hanscom Air Force Base. April 2018. *Hanscom Air Force Base Fact Sheet*. <https://www.hanscom.af.mil/About-Us/Fact-Sheets/Display/Article/379461/hanscom-air-force-base/>

⁵⁹ U.S. Army Corps of Engineers, U.S. Air Force. 2014. *Environmental Assessment, Hanscom Air Force Base Vandenberg Gate Complex Construction*.

are land use, transportation, housing and economic development, climate and clean energy, public safety, and municipal administration. The most recent plan published by the MAPC is the MetroFuture in 2008.⁶⁰ In 2018, MAPC launched a new two-year planning process to develop an update to Greater Boston's regional plan, called MetroCommon 2050: Shaping our Region Together.⁶¹

The MetroFuture plan aims to make the lives of people who live and work in the Metropolitan Boston area better, between its publication and 2030. MetroFuture envisions a region where growth is focused in areas where it already exists and linked by an efficient transportation system; land and natural resources are conserved; investments are made in health and education; and opportunities are available to all residents of the region. Through this plan, MAPC has created demographic and economic projections of the region's future, including the four towns located adjacent to Hanscom Field. MetroFuture identified 65 "Goal Statements" that are specific to Metropolitan Boston, and not specifically applicable to Hanscom Field. Noteworthy goal statements that pertain to future planning at Hanscom are included in Table 4-5.

The current and future use of Hanscom Field is consistent with smart growth principles.⁶² Table 4-6 presents MAPC's 15 Smart Growth principles and their relationship to Hanscom Field.

Table 4-5 Applicable Goals to Hanscom Field for Metropolitan Boston's MetroFuture's Goal Statements

Goal #	Goal Statement
1	Population and job growth will be concentrated in municipalities already well served by infrastructure, with slower growth in less developed areas where infrastructure is more limited.
36	Businesses will grow expeditiously thanks to consistent and predictable economic development policies set by an informed public sector.
37	A strong supply of educated and skilled workers—of all ages—will encourage businesses to locate and expand here.
44	An expanded transit system will provide better service to both urban and suburban areas, linking more homes and jobs.
46	Commuters will have more options to avoid congestion.
47	Most people will choose to walk or bike for short trips.
49	Outlying areas will see little increase in traffic congestion.

⁶⁰ Metropolitan Area Planning Council. 2008. *MetroFuture, Making a Greater Boston Region, Regional Plan*.

⁶¹ Metropolitan Area Planning Council. 2018. *MetroCommon 2050*. <https://metrocommon.mapc.org/>

⁶² According to the MAPC, smart growth includes "sound municipal management, sustainable land use, protection of natural resources, efficient and affordable transportation, diverse housing stock, public safety, economic development, clean energy, healthy communities, an informed public, and equity and opportunity among people of all backgrounds", <https://www.mapc.org/aboutus/#missionsgp>.

Goal #	Goal Statement
51	Regional transportation planning will be linked with sustainable land use planning.
52	The transportation system will be reliably funded and transportation agencies will demonstrate accountability to the public.
55	The region's businesses will access the global marketplace through an efficient freight transportation network.
Source: MetroFuture Goals and Objectives, MetroFuture, Making a Greater Boston Region, Regional Plan, Metropolitan Area Planning Council, 2008	

Table 4-6 MAPC Smart Growth Principles and their Applicability to Hanscom Field

Principle	Response/Applicability
1) Encourage community and stakeholder collaboration in development decisions.	Massport is engaged in on-going meetings and discussions with the four towns through the Hanscom Field Advisory Commission (HFAC).
2) Integrate people and place.	Not Applicable. This principle is oriented toward development within communities.
3) Promote regional equity and reduce local and regional disparities.	The presence of air travel at Hanscom Field offers a service for residents and businesses in the surrounding region who would otherwise be traveling greater distances to use a facility elsewhere.
4) Strengthen regional cooperation.	Massport is engaged in on-going community discussions through the Hanscom Field Advisory Commission (HFAC) process.
5) Promote distinctive, attractive communities with a strong sense of place.	The ESPR provides a comprehensive evaluation of the cumulative environmental effects of Hanscom Field and a retrospective analysis of changes at the airport. The ESPR process provides a framework to identify and plan for potential environmental effects at the airport and in the surrounding communities.
6) Preserve open space, farmland, and critical environmental resources.	Massport manages the environmental resources at Hanscom Field to address issues related to wetlands, watersheds, and drinking water supplies. In addition, Massport maintains open space/trails at Hanscom Field.
7) Encourage development in currently developed areas to take advantage of existing community assets.	Hanscom Field is an existing resource that is well served by existing infrastructure. Massport encourages any development at Hanscom Field in areas of previous development, where applicable.

Principle	Response/Applicability
8) Mix land uses.	Hanscom Field integrates a mix of land uses compatible with airport use, which in turn supports economic development around the airport and transportation demand management initiatives.
9) Take advantage of compact development design and create walkable neighborhoods.	Massport seeks to make effective use of existing impervious surface, utility systems and built areas at Hanscom Field. Wherever possible, new development is planned for previously developed areas.
10) Promote economic development in ways that produce jobs, strengthen low and moderate-income communities, and protect the natural environment.	Hanscom Field supports air travel needs of existing businesses in the region and provides jobs for area residents. Massport is a responsible manager of environmental resources at Hanscom Field. Massport requires third-party development as well as its own development at Hanscom Field to achieve the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Certification.
11) Create a range of housing opportunities and choices in cities and towns throughout the region.	Not Applicable.
12) Promote more transportation choices through the appropriate development of land.	Hanscom Field satisfies a regional demand for air travel for people in the surrounding region who would otherwise be traveling greater distances to use a facility elsewhere.
13) Develop predictable, fair, and cost-effective regulatory approvals for smart growth-oriented developments.	Not Applicable.
14) Encourage fiscal policies that support smart growth.	Massport is guided by fiscal prudence with respect to plans for smart growth at Hanscom Field.
15) Enable smart growth by reforming existing zoning.	Not Applicable.
Source: MAPC, Smart Growth Principles for the Metropolitan Area Planning Commission, 2018	

4.2 Airport Planning

This *2017 ESPR* includes a series of conceptual plans developed as options to meet potential future demand associated with the forecast of activity as described in Chapter 3 Airport Activity Levels. The planning concepts represent a vision of what could occur, not necessarily what will occur and they provide a basis for consideration of potential future environmental and operating impacts. These concepts place a priority on sustainable development including the reuse of existing facilities and developed land, fiscal prudence, and natural resource conservation.

4.2.1 Description of Existing Conditions & Planning Areas

As with earlier ESPRs, for the purposes of the *2017 ESPR*, Hanscom Field has been divided into planning areas based on geographic considerations, in order to facilitate the discussion of planning for future aviation-related facilities and the evaluation of the conceptual development scenarios.

Five planning areas in 2017 ESPR (shown in Figure 4-2):

- ⇒ North Airfield
- ⇒ Northeast Airfield
- ⇒ East Ramp
- ⇒ West Ramp
- ⇒ Pine Hill

The FAA Airport Traffic Control Tower and apron, previously identified in the *2012 ESPR*, is now included as part of the East Ramp planning area in this ESPR. The Terminal Area, previously identified in the *2012 ESPR*, has been renamed the West Ramp in this ESPR.

Third-party developers undertake the majority of development at Hanscom Field. In preparing the ESPR and assessing locations for future development, Massport must consider a range of aviation compatible and non-aviation compatible development types. This

requires Massport to identify a variety of sites capable of accommodating future development opportunities. To do so, Massport assesses areas at Hanscom Field that can be developed to meet all safety and security requirements with the fewest environmental impacts. This includes setting aside all land required by FAA per their safety regulations (e.g. runway safety areas, object free areas). The development areas that are evaluated within the ESPR provide market-driven development opportunities to third-party developers.

The *2017 ESPR* follows a similar planning method to the ones outlined in earlier ESPRs with a few differences. The *2005 ESPR* divided Hanscom Field into six planning areas: North Airfield, East Ramp, Terminal Area, Runway 5 Approach Area, Pine Hill, and West Airfield. The North Airfield area has been divided into two planning areas for the purpose of this ESPR (North and Northeast Airfields, west and east of Runway 5/23) and the Terminal area has become part of the West Ramp. Although the Runway 5 Approach and West Airfield Areas were included in the *2005 ESPR*, these areas had no aviation-related initiatives and facilities planned. Similarly, these two areas have been excluded from consideration for aviation-related facilities in this

ESPR and therefore they are not listed among the five planning areas. The *2012 ESPR* also divided Hanscom Field into six planning areas: North Airfield, East Ramp, Terminal Area, ATCT Apron, Pine Hill, and West Airfield. Pine Hill and West Airfield areas were provided for consistency with the *2005 ESPR*, but no new development was planned in these areas. The ATCT Apron was a new planning area identified in the *2012 ESPR*, which has been merged with the East Ramp planning area in the *2017 ESPR*.

North Airfield

The North Airfield encompasses property northwest of Runway 11/29, with a focus on sites accessible from Taxiway R. Currently, there is limited development on the North Airfield. Raytheon operated a 16-acre section on the eastern portion of North Airfield until 2000, the U.S. Navy currently owns this land. It includes two connected aviation hangars, and associated apron. In recent years, Massport had worked with the Government Services Administration (GSA) regarding a transfer of ownership for this property; however, in April 2018, this effort was discontinued. In February 2019, the Navy Hangar site was sold at public auction administered by the General Services Administration (GSA). The development of this land by third parties would be governed by state and local regulations, subject to FAA review. Edge Sports leases a portion of the North Airfield site north of Hartwell Road from Massport and two synthetic turf athletic fields were constructed in 2013 adjacent to their existing facility.

The North Airfield was also identified in the *2005 ESPR* as a future development area with a potential limousine garage planned for an airport tenant and additional GA facilities with parking spaces. The *2012 ESPR* also defined the North Airfield area as the property north of Runway 11/29, both west and east of Runway 5/23. Planned initiatives included new GA and corporate hangar facilities, at this time, reuse of the Navy Hangar would be by third parties.

Northeast Airfield

Massport leases a large portion of the Northeast Airfield to the USAF, known as Parcel B. The Northeast Airfield site also houses the FamCamp, a Recreational Vehicle (RV) campsite open to military personnel, including employees of Hanscom AFB. FamCamp offers a total of 73 RV sites, most equipped with water, sewer, and electric hookups. This area is primarily comprised of wooded open space on the airport property.

The Northeast Airfield was part of the North Airfield planning area in the both the *2005* and *2012 ESPRs*. No new facilities were planned east of Runway 5/23 (now called Northeast Airfield) in either of these *ESPRs*.

East Ramp

The East Ramp includes the apron and hangar facilities in the area southeast of the Runway 11/29 and Runway 5/23 intersection and properties previously identified as the Air Traffic Control Apron. Hartwell Avenue and the Shawsheen River in the Towns of Lexington and Bedford bound the East Ramp area on the east side. On the west, Taxiway S and the Air Traffic

Control Tower bound it. A mix of Hanscom AFB and Massport property hangars occupy the southern edge of the East Ramp. A Fixed Base Operator (FBO) occupies Hangars 1, 2, and 3 on Massport property. Additionally, the USAF Fire Department, an FBO fuel farm, the ARFF, the CBP trailer, and Massport's fueling facility are located in this area. Other facilities include sand storage, FAA equipment storage, and navigational aids.

The Airport Traffic Control Tower, Massport Field Maintenance, and ARFF occupy the western portion of the East Ramp. The CBP trailer plans to relocate from the eastern edge of the East Ramp to a new location just north of the Air Traffic Control Tower (as shown on Figure 4-5).

Massport does not have direct landside access to the East Ramp, as Hanscom AFB and other stakeholder properties surround it. Currently the USAF controls access through the AFB to the East Ramp for any non-military tenants wanting access to the East Ramp. Access is controlled through the AFB main gate on Vandenberg Drive and airside access occurs at a gate adjacent to Hangar 3.

The East Ramp area in the *2017 ESPR* is the same planning area that was described in the *2005 ESPR*, and it is the combined area of the East Ramp and ATCT Apron from the *2012 ESPR*. Both the *2005* and *2012 ESPRs* identified this area for new GA and corporate facilities with a possibility of providing alternative land side access. The *2005 ESPR* also recommended potential cargo facilities, while the *2012 ESPR* recommended the relocation of customs from this area.

West Ramp

The West Ramp includes properties previously identified as the Terminal Area. The Air Traffic Control Tower, on the west by Runway 5/23 and Virginia Road bound the West Ramp on the north, on the south by Old Bedford Road, and on the east by Hanscom AFB. Primary landside access is provided from Hanscom Drive and Old Bedford Road. Specific facilities located within the West Ramp include the Civil Air Terminal as well as supporting facilities, such as public parking, FBOs, flight schools, T-hangars, airport maintenance facilities, fuel farms, and several privately-operated facilities.

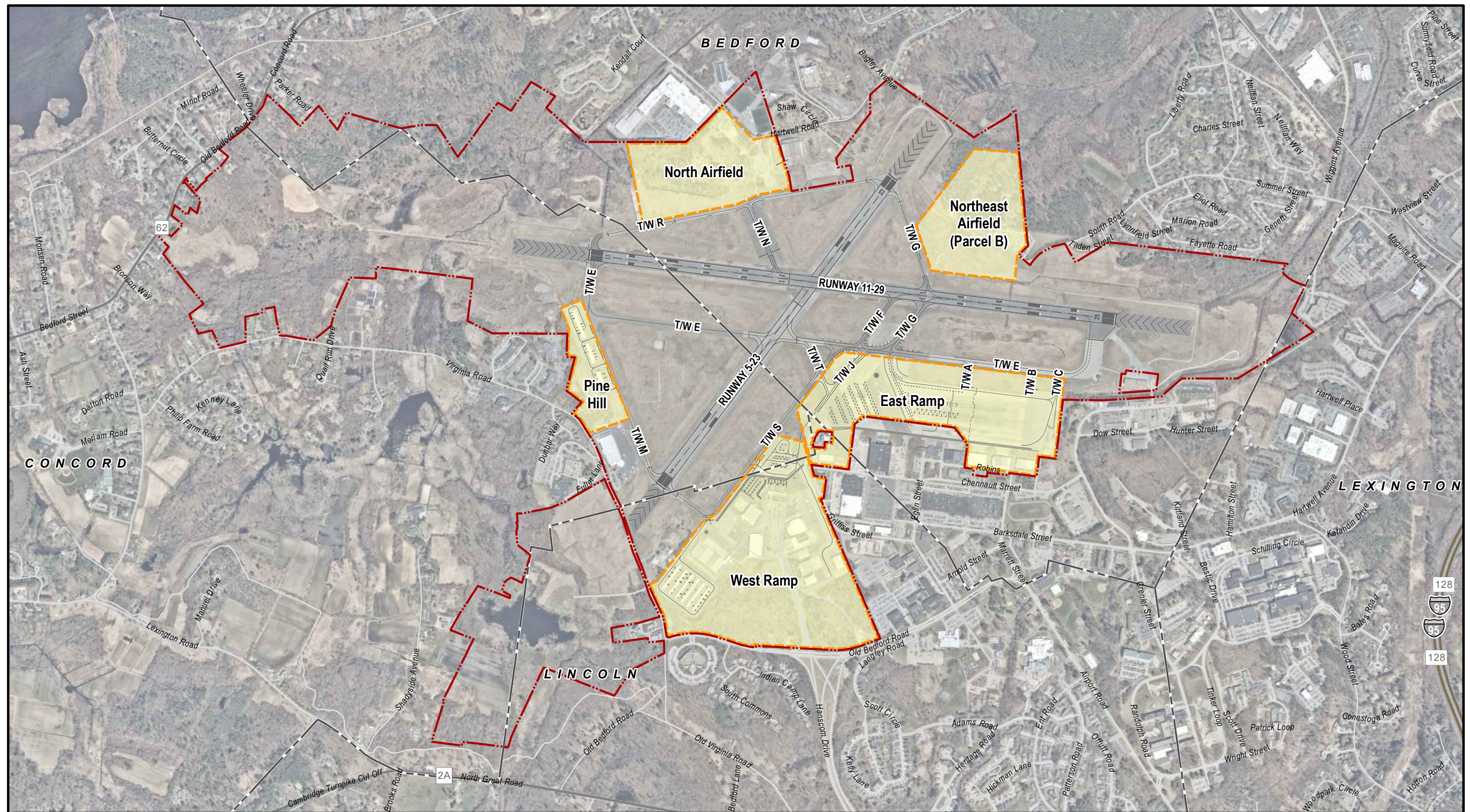
The *2005 ESPR* identified the West Ramp (then called Terminal Area) as a potential area for new GA facilities and a hotel with parking spaces. It also recommended relocating the T-hangars to the East Ramp. The *2012 ESPR* identified this area as the potential new home of the Air and Space Museum with additional GA and corporate aviation facilities.

Pine Hill

Pine Hill is located southwest of the Runway 11/29 and Runway 5/23 intersection and is served on the airside by Taxiway M. It is the narrowest planning area given the property boundaries and Taxiway M. Landside access is limited and provided from Virginia Road. It is primarily occupied by T-hangars and an FBO.

The 2005 *ESPR* recommended new GA facilities including hangars and ramp, with parking spaces to be built in the Pine Hill area. No updates or new planned initiatives were provided in the 2012 *ESPR*. The 2012 *ESPR* included the Ross-Rectrix Aviation FBO facility as part of the Pine Hill planning area, which now exists on this site.

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- Hanscom Field Property Boundary
- Planning Area
- Municipal Boundary



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Summary of Planning Areas

Data Sources: Massport (ALP) October 24, 2017;
 MassGIS (Roads, Rail), July 30, 2018;
 MassGIS (Community Boundaries), July 30, 2018;
 NearMap USA (Aerial) July 30, 2018

Figure 4-2



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4.2.2 Current Planning Initiatives

To inform the planning and site development processes, Massport reviews forecasts of future aviation activity and future operations by different types of aircraft (e.g. single engine piston, jet) to inform plans for airfield development. For example, runway length can be evaluated to determine if it is sufficient for future aircraft operations, and airfield geometry can be reviewed to ensure that the airfield meets the FAA standards for the critical aircraft operating on various portions of the airport. One near-term study Massport has planned, with close coordination with FAA, is a review of airfield geometry with the goal of mitigating the risk of runway incursions.

In addition to considering forecasts during the planning process, Massport promotes development of its facilities in sustainable manner and takes steps to minimize the environmental impacts of Hanscom Field. The ISO 14001 Certification of Hanscom Field recognizes Massport's progressive environmental program and policies, including Best Management Practices (BMPs), described in Chapter 11 of the *ESPR*. Massport supports the more efficient use of Hanscom Field within the broader context of growth management and sustainability.

Massport is a leader among Massachusetts agencies in promoting and implementing sustainable designs. New facilities at Hanscom Field must meet certain energy efficiency and sustainable design standards, and achieve the US Green Building Council's (USGBC) Leadership in Energy and Environment Design (LEED) Silver Certification.⁶³ In 2017, Jet Aviation's new Hangar 17 and FBO facility achieved LEED Silver certification. Boston MedFlight also expects to achieve LEED Silver certification for the re-developed Hangar 12A in 2019. Additional information on Massport's sustainable design standards can be found in Chapter 11 Sustainability and Environmental Management.

Finally, Massport has initiated a number of projects since the *2012 ESPR* including the rehabilitation of existing apron and runway pavements, third-party redevelopment of Hangar 17 and Hangar 12A, and various other maintenance activities at Hanscom Field. Massport will continue to describe planned and potential projects in this and forthcoming *ESPRs*.

4.2.3 Facility & Infrastructure Requirements

The forecasts of aviation activity levels discussed in Chapter 3 Airport Activity Levels, project the majority of the operational growth at Hanscom Field to be related to the business aviation segment of the market. Conversely, personal and single engine piston flying have declined and are expected to continue to do so during the forecast period.

Facility requirements are derived, in part, from the number of based aircraft expected to be located on the airport, which are projected in Chapter 3. Based on a 2017 survey, 350 aircraft

⁶³ LEED is an internationally recognized green building rating system that is credit-based, with different certification levels awarded depending on number of credits achieved. More information at <https://new.usgbc.org/leed>.

are based at Hanscom Field. This is an increase from 2012 when there were 272 based aircraft. A breakdown of the aircraft types is provided in Table 4-7. Using the forecast growth of each aircraft type, a based aircraft projection for 2025 and 2035 is provided. Business aviation based aircraft are expected to grow in alignment with the operations forecast.

Table 4-7 Existing and Forecast Based Aircraft

Aircraft Type	Existing 2017	Forecast	
		2025	2035
Single Engine Piston (SEP)	191	178	195
Single Turboprop	17	23	31
Multi Engine Piston (MEP)	21	21	23
Multi Engine Turboprop	12	16	22
Jet	93	118	153
Helicopter	16	19	23
TOTAL	350	376	447

Source: 2017 data is based on Massport records provided in 2018; forecast data is from InterVISTAS, 2018.

T-Hangar occupancy was reviewed to determine the future facility needs for single engine piston aircraft. Current occupancy of the 110 stalls serving the nine existing T-hangars is nearly 100 percent. In addition, corporate and FBO hangar occupancy was evaluated. The three FBOs at Hanscom Field, which store primarily jets, also reported nearly 100 percent occupancy. The three corporate hangars located on the East Ramp, West Ramp, and Pine Hill are nearly 100 percent occupied with jet aircraft as well. In the recent past, the FBOs on the Airport have been turning away customers that are seeking aircraft storage space. These capacity constraints result in additional aircraft operations at Hanscom Field as aircraft must be ferried from FBOs at other airports in order to serve customers at Hanscom. An arrival and departure operation instead result in two arrivals and two departures.

Based on the occupancy and fleet mix, the facility requirements project a continued capacity shortfall for corporate and FBO hangar space. Further, T-Hangars A, B, and C have reached the end of their useful life and construction of replacement hangars will be completed in 2019. No additional capacity for T-hangars or tie-down is expected in 2025, but existing hangars will be replaced or relocated as they reach the end of their useful life.

New corporate and FBO hangars must be capable of accommodating jets as well as turboprops. Given the proposed fleet mix, approximately 7,500 square feet of hangar area is required per aircraft. With the expected growth in based aircraft of 25 business jets and six turboprops in 2025, approximately 210,000 square feet of hangars would be required. Between 2025 and 2035, projected growth of ten business jets and eight turboprops results in the need for an additional 120,000 square feet of hangars by 2035.

4.2.4 Development Sites to Meet Demand

This section describes the characteristics of the potential future planning concepts for the 2025 and the 2035 scenarios. Figure 4-2 illustrates the potential development opportunity areas at Hanscom Field.

The planning concepts considered provide flexibility to respond to the anticipated variability of future demand in a coordinated fashion. The concept layouts are shown for illustrative purposes only and are expected to evolve over time. Detailed environmental analyses would be required for projects that move from conceptual planning to the proposal stage whenever MEPA, NEPA or other regulatory thresholds are triggered. However, because third-party developers complete most new development at Hanscom Field, Massport's planning is programmed to be flexible and able to respond to changing conditions and regional demands.

The following discussion of development sites presents a general context for the future planning of potential general aviation facility development. The array of general aviation hangars identified in Table 4-8 exceeds the expressed facility requirements in Section 4.2.3 for

Future airport planning concepts are based on:

- ⇒ The facility requirements described in this chapter, based on the forecasts of aviation activity level discussed in Chapter 3 Airport Activity Levels;
- ⇒ Infrastructure condition described in Chapter 2 Facilities and Infrastructure; and
- ⇒ Market and industry forces and disrupters that shape and alter demand for airport facilities and infrastructure.

General approach to identifying development sites in each of the four planning areas:

- ⇒ Infilling development in the West Ramp, specifically the terminal area, which has existing infrastructure to support new general aviation facilities;
- ⇒ Reusing previously developed areas in the North Airfield Area that utilize the northern edge of the airport;
- ⇒ Optimizing Pine Hill facilities given limited available geometry of this area; and
- ⇒ Accommodating aviation-related facilities on the East Ramp, which includes maximizing the use of the existing apron area.

aircraft storage for both the 2025 and 2035 scenarios, while providing a range of potential development options. Providing for a range of development accounts for the inherent uncertainty with future general aviation demand, and allows Massport to facilitate general aviation hangars as demand materializes. The concepts for the Hanscom Field planning areas provide a basis to evaluate the range of cumulative environmental impacts of these potential development options under the 2025 and 2035 scenarios. Table 4-8 summarizes potential planning concepts for the 2025 and 2035 scenarios for each of the areas on the airport.

Table 4-8 Hanscom Field Planning Concepts for 2025 and 2035

Planning Area	2017 Existing Uses	2025 Scenarios (2017-2025)	2035 Scenarios (2026-2035)
North Airfield	Currently vacant	General aviation (GA) hangars with aircraft parking utilizing existing impervious surface where possible; T-hangars and corporate hangars.	Additional corporate hangars
Northeast Airfield	Currently vacant	None	Development reserve on Parcel B site, upon reversion to Massport.
East Ramp	General aviation, including FBO and fueling facilities	GA hangars with new aircraft parking spaces; Expansion of GA facilities and upgrading or replacement of existing GA hangars; Expansion of the airport maintenance facility and corporate hangars.	Corporate hangars with new aircraft parking spaces; Alternative landside access; Further expansion of the airport maintenance facility.
West Ramp	General aviation, including FBO and T-hangars; Civil Air Terminal	Upgrading or replacement of corporate hangars with new aircraft parking spaces; Salt storage facility relocation; Civil Air Terminal enhancements.	New corporate hangars; Civil Air Terminal enhancements; New and replacement structured public parking spaces as needed; Strategic development reserve along Hanscom Drive (e.g., office, hotel, museum).
Pine Hill	General aviation, including T-hangars and FBO	Corporate facilities with new aircraft parking spaces.	Additional corporate facilities (on former Draper labs site).

North Airfield

Figure 4-3 illustrates 2025 and 2035 planning concepts for the North Airfield. North Airfield concepts include new GA and corporate hangar facilities, primarily along Taxiway R and Hartwell Road. The development site is approximately 15 acres and also bordered by the U.S. Navy Hangar to the east. As of March 2019, the Navy Hangar site was sold at public auction

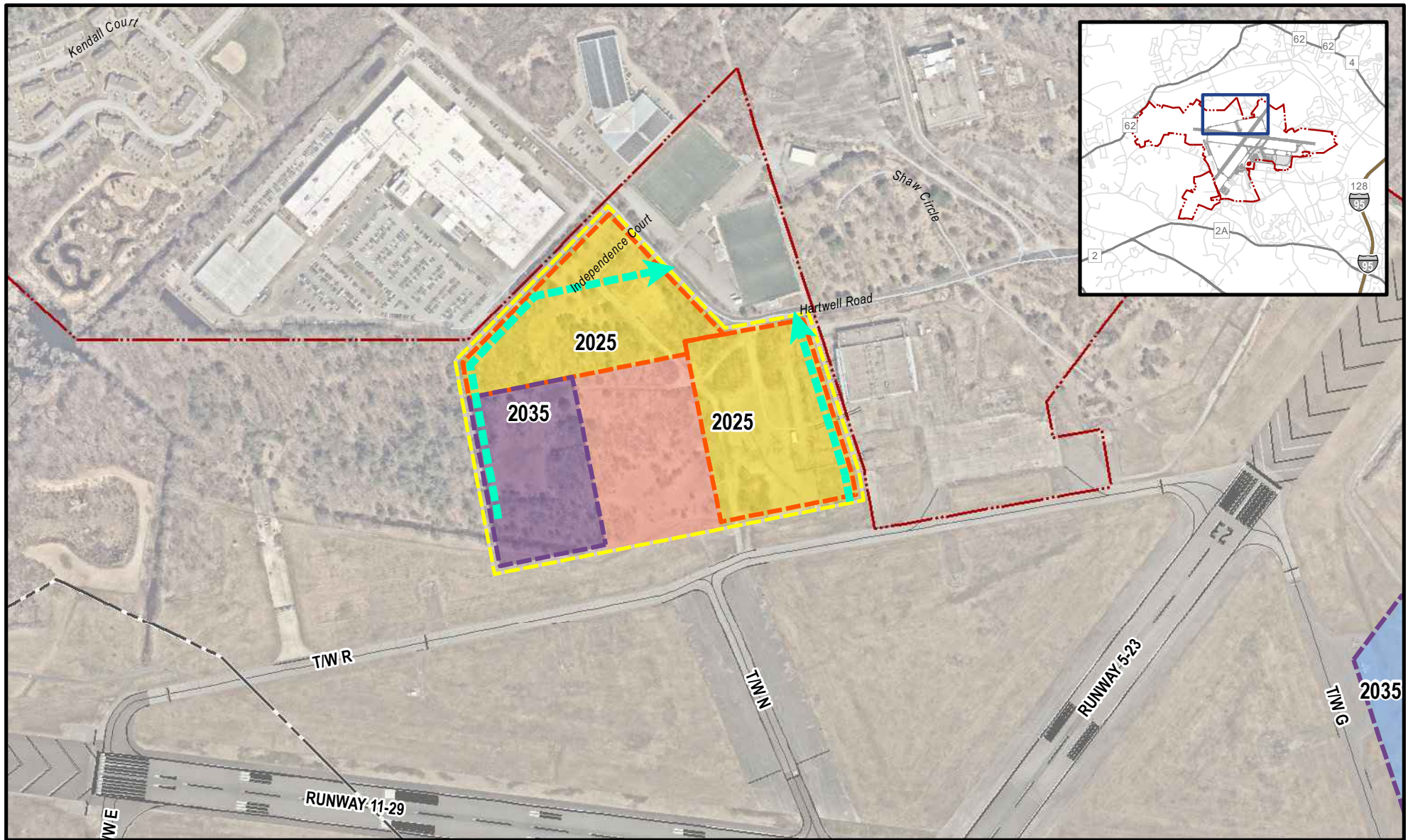
administered by the General Services Administration (GSA). The development of this land by third parties would be governed by federal, state and local regulations.

Multiple corporate hangars could be accommodated in the 2025 scenario just west of the U.S. Navy Hangar. In addition, T-hangars will be demolished on the Pine Hill site, replacement T-hangars are planned to be constructed between Hartwell Avenue and the Instrumentation Laboratory. This site makes use of existing impervious surfaces and will avoid wetlands. In 2035, additional hangars could be constructed adjacent to the wetlands, just west of the proposed 2025 development. To prepare for future development on this site, an Environmental Assessment for development of aviation facility projects on the North Airfield was completed in September 2018. This EA and the subsequent Finding of No Significant Impact (FONSI) by the FAA found that proposed developments were consistent with national policies and other applicable environmental requirements and they will not affect the quality of the human environment. According to the EA, the North Airfield planned development area would be able to accommodate up to 165,000 square feet of new hangar space and associated administrative offices.

In February, 2018, Massport issued a Request For Proposals (RFP) for hangar development in the North Airfield area. Due to the relocation of the Pine Hill T-hangars to the North Airfield, Massport reserved approximately 55,000 square feet of space that is not available for other hangar development. As a result, approximately 110,000 square feet of hangar development remains available.

Northeast Airfield

Figure 4-4 illustrates 2025 and 2035 planning concepts for the Northeast Airfield. U.S. Air Force Parcel B, located adjacent to Taxiway G, should be preserved for future aviation or aviation compatible use in the 2035 planning scenario. Massport owns this property and leases it to the USAF. The lease is expected to expire in 2027. Landside access would be provided from South Road and airfield access would be provided from Taxiway G. This site is isolated from the other developments on the airport and would also require clearing of the FamCamp RV campsite.



- | | | | |
|--|--|--|---------------------------------|
| | 2025 Planning Scenario | | Hanscom Field Property Boundary |
| | 2035 Planning Scenario | | Municipal Boundary |
| | Apron Development | | Development Areas |
| | Hangar Parcel Development | | |
| | Aviation Compatible Development Parcel | | |
| | Proposed Roadway | | |

Data Sources: Massport (ALP) October 24, 2017;
 MassGIS (Roads, Rail), July 30, 2018;
 MassGIS (Community Boundaries), July 30, 2018;
 NearMap USA (Aerial) July 30, 2018

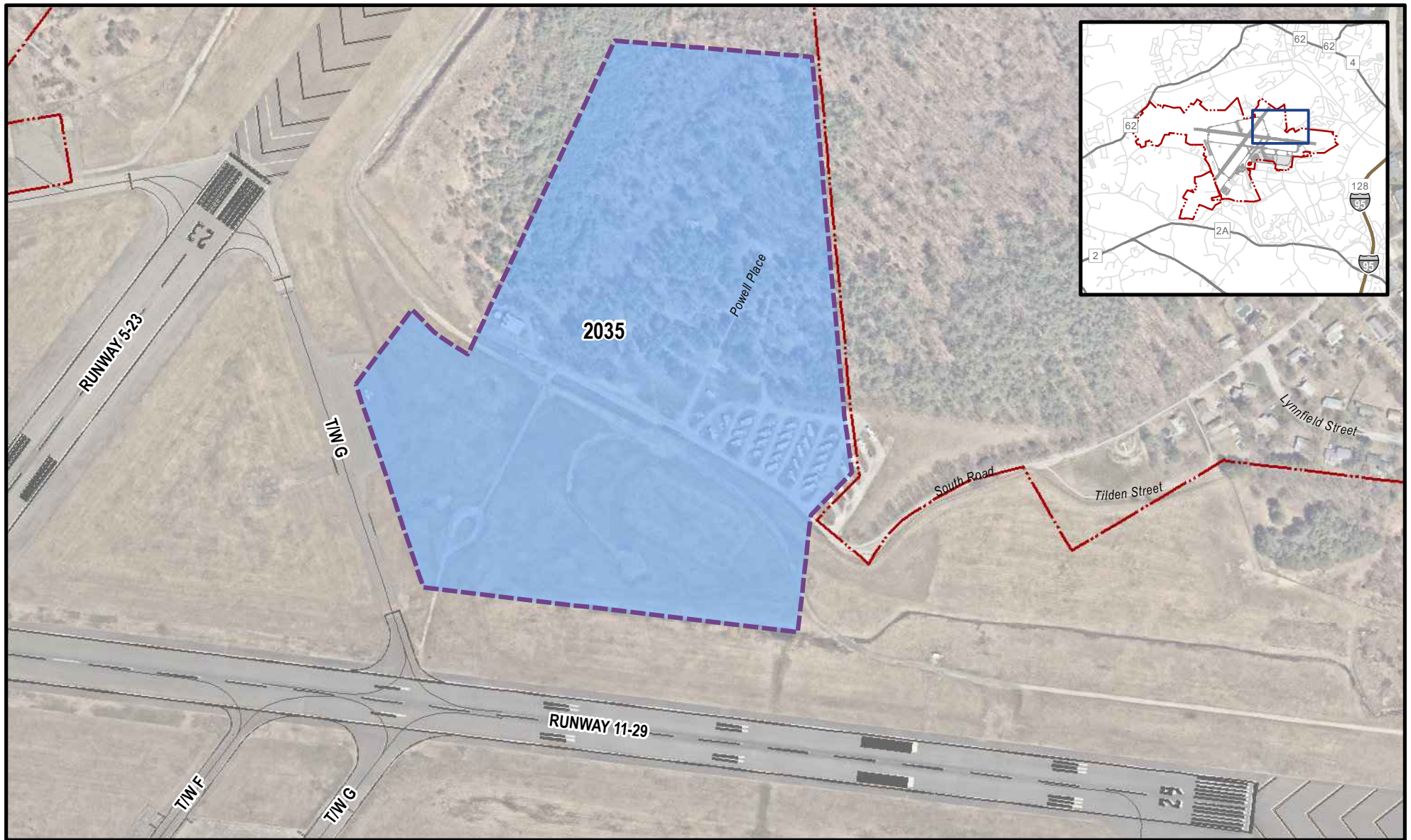


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North Airfield Planning Concepts

Figure 4-3



- | | | | |
|--|--|--|---------------------------------|
| | 2025 Planning Scenario | | Hanscom Field Property Boundary |
| | 2035 Planning Scenario | | Municipal Boundary |
| | Apron Development | | |
| | Hangar Parcel Development | | |
| | Aviation Compatible Development Parcel | | |
| | Proposed Roadway | | |

Data Sources: Massport (ALP) October 24, 2017;
 MassGIS (Roads, Rail), July 30, 2018;
 MassGIS (Community Boundaries), July 30, 2018;
 NearMap USA (Aerial) July 30, 2018



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Northeast Airfield (Parcel B) Planning Concepts

Figure 4-4

East Ramp

Figure 4-5 illustrates 2025 and 2035 planning concepts for the East Ramp. The concepts include proposed GA and corporate hangar facilities along with reconfigured aircraft access from Taxiway E and a possible landside connection that would not require controlled access through the Hanscom AFB. The East Ramp is a suitable site for hangar development because the apron, taxiway, and utility infrastructure are already available.

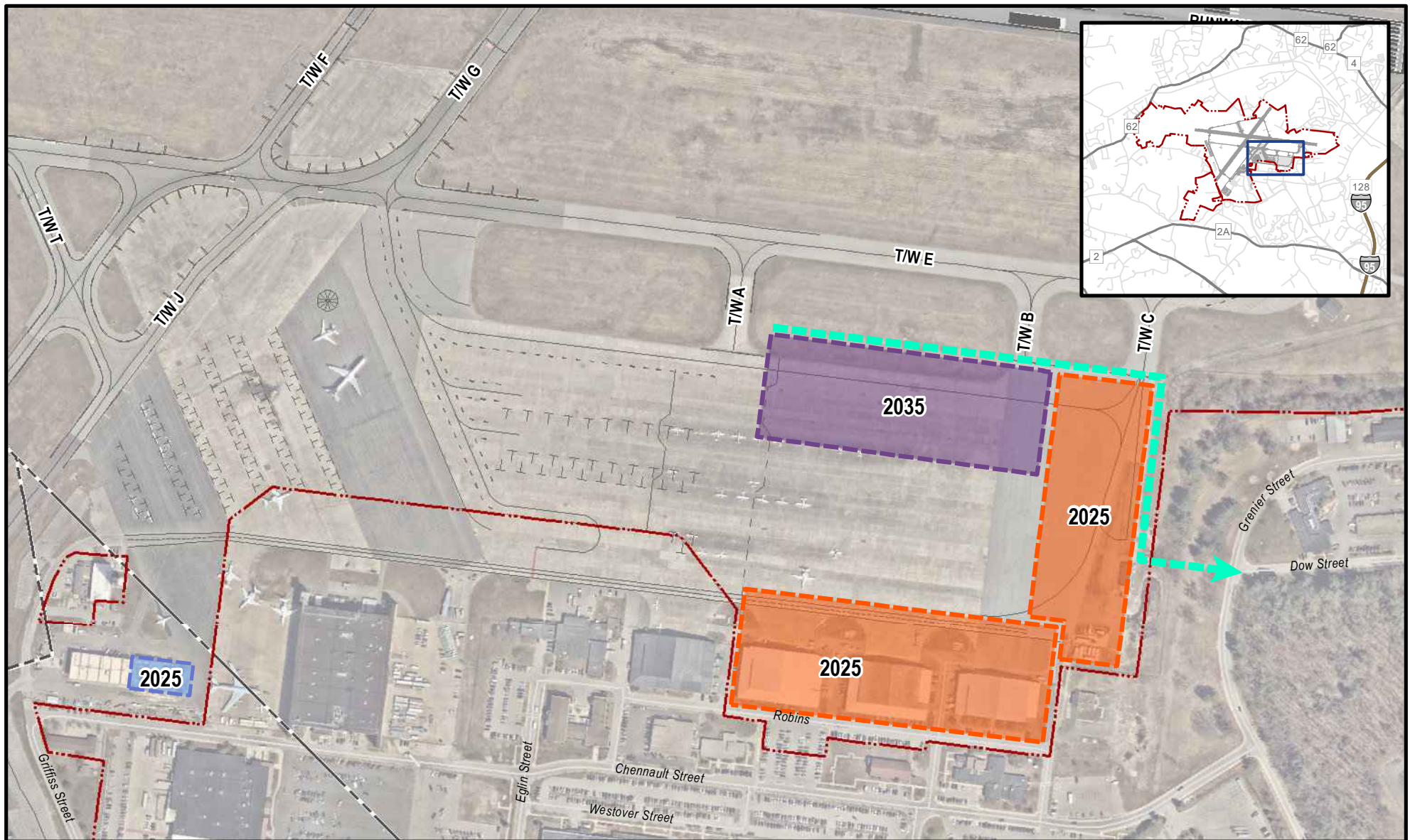
Recent development has already occurred near the ATCT. New ARFF facilities and U.S. CBP facilities are under construction just north of the ATCT. The field maintenance facility, currently located just south of the ATCT, is proposed to be expanded before 2025. Accordingly, there are limited opportunities to expand on this western portion of the East Ramp beyond the proposed projects.

The relocation of the U.S. CBP facility opens the eastern edge of the East Ramp for aviation development. Apron frontage along the eastern edge of the apron could provide hangars totaling approximately 60,000 square feet. Additional hangars could be constructed on the northeast corner of the East Ramp in the 2035 scenario, but this development scenario would require the closure of Taxiway C and the widening of Taxiway B to accommodate the Aircraft Design Group (ADG) Group IV (e.g. Boeing 757) aircraft that often use the ramp. Taxiways A and G would continue to provide access to the East Ramp. Landside roadway access from Grenier Street and utility infrastructure would have to be constructed to provide access to any development on the northeast corner of the East Ramp. Airside access for existing FBOs on the West Ramp would remain as is.

There is also the potential opportunity for renovation of the Hangars 1, 2, and 3 located on Massport property. These hangars could be expanded by building additional depth toward the north. Limited expansion opportunities are available to the south for these existing hangars, however, due to the property line bordering Hanscom AFB.

Any development along the East Ramp would need to be coordinated with both the line of sight from the ATCT as well as the Federal Regulation Title 14 Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace (FAR Part 77) imaginary airspace surfaces emanating from Runway 11/29. Neither the surfaces nor the line of sight requirements is likely to present a considerable constraint to aviation development on the site.

As discussed in the description of the planning areas, the East Ramp does not have direct landside access without passing through the AFB and its multiple layers of security vetting and credential checks. Future access to the East Ramp could include escorted travel from a point near the Civil Air Terminal, through the Hanscom AFB, or via a new roadway connection from Hartwell Avenue. Potential alignments for direct access between Hartwell Avenue and the East Ramp are provided in Chapter 6; these alignments have been presented in previous ESPRs dating back to 2000.



North
0 200 400 Feet

- | | | | |
|--|--|--|---------------------------------|
| | 2025 Planning Scenario | | Hanscom Field Property Boundary |
| | 2035 Planning Scenario | | Municipal Boundary |
| | Apron Development | | |
| | Hangar Parcel Development | | |
| | Aviation Compatible Development Parcel | | |
| | Proposed Roadway | | |

Data Sources: Massport (ALP) October 24, 2017;
MassGIS (Roads, Rail), July 30, 2018;
MassGIS (Community Boundaries), July 30, 2018;
NearMap USA (Aerial) July 30, 2018



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East Ramp Planning Concepts

Figure 4-5

West Ramp

Figure 4-6 illustrates 2025 and 2035 planning concepts for the West Ramp, which focuses on the terminal area off Hanscom Drive. West Ramp concepts include possible corporate hangar facilities, improvements in and around the passenger terminal, as well as strategic reserve areas located along the main entrance roadway corridor to the terminal area. Non-aeronautical development within the strategic reserve area could include offices, hotels, museums or other commercial opportunities, as have been mentioned in the 2005 and 2012 ESPRs.

Within the terminal area, several development opportunities exist. More specifically, expansion or redevelopment of the hangars on the east side of Hanscom Drive is possible to optimize the site. With increased demands in the terminal area, especially if scheduled commercial service returns during the planning period, alternative parking sites should be identified. Relocating the salt storage facility from the south end of the existing parking lot to a site near the Hanscom Drive and Vandenberg Drive intersection would improve environmental controls and allow for replacement of surface parking facilities adjacent to the new Jet Aviation Hangar. As demand warrants in the longer-term 2035 scenario, structured parking may be required adjacent to the Civil Air Terminal. In the 2035 scenario, additional general aviation hangars are possible with redevelopment of the T-Hangar area.

Property along the southern edge of Hanscom Field, along Old Bedford Road and Vandenberg Drive should be maintained as strategic reserve for future aviation compatible use. Several wetlands exist in these parcels, so the specific parameters of development would have to be further evaluated to avoid, minimize or mitigate any potential environmental impacts. In addition, Hanscom AFB is relocating its main gate on Vandenberg Drive. The relocated gate is proposed to the west of the current location, just before Hanscom Drive. The new gate limits landside access to the future development sites on the west side of the southern edge of Hanscom Field, but access to Hanscom Field would be maintained via Hanscom Drive.

Pine Hill

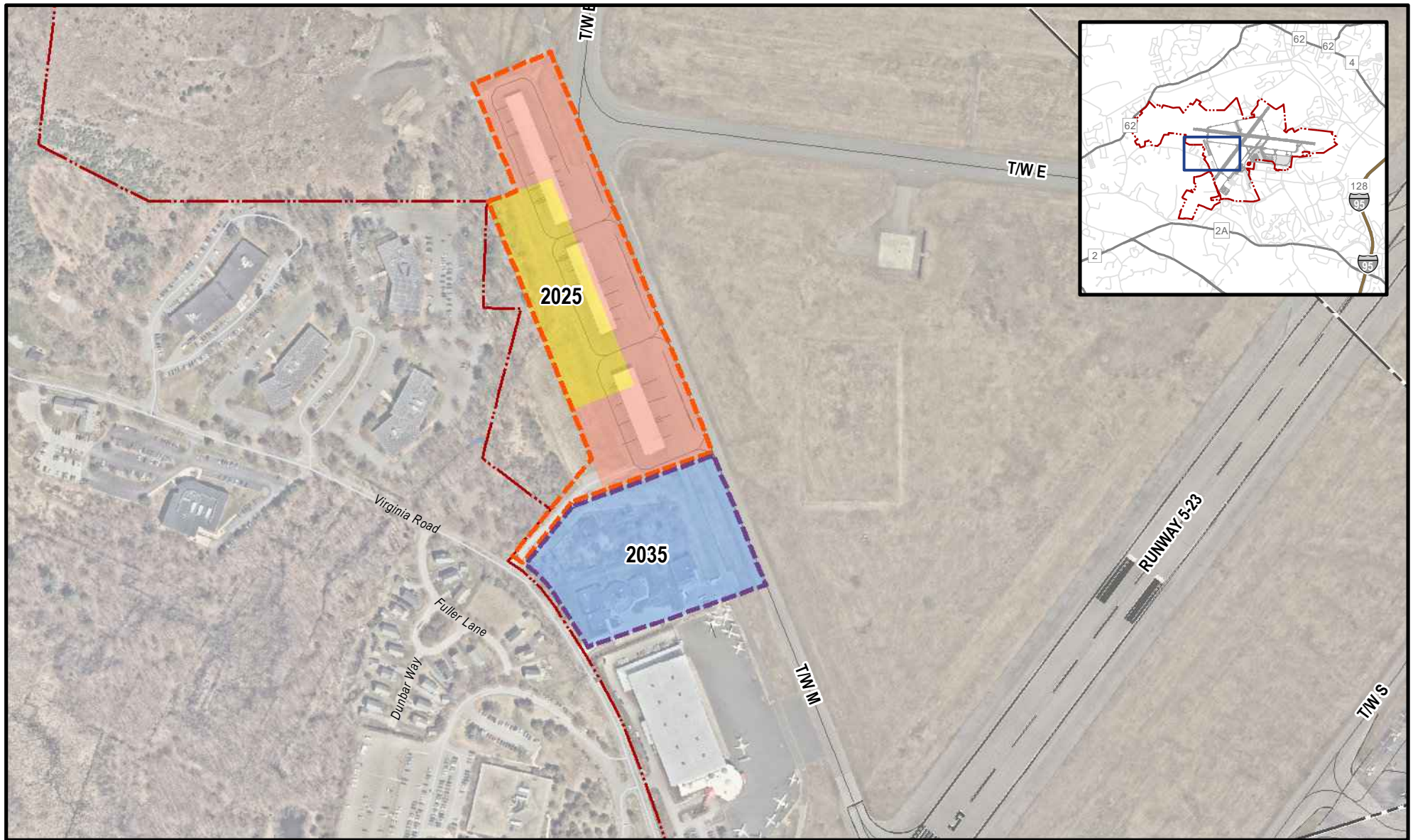
Figure 4-7 illustrates the 2025 and 2035 planning concepts for the Pine Hill development site. Pine Hill was reevaluated in the 2005 and 2012 ESPRs, and recent third-party interest has introduced changes to the future recommendations on Pine Hill. The development area on Pine Hill consists of just over 10 acres, currently encompassing the three T-hangars north of Hangar 24.

As part of the recent Hanscom Aviation Facility Improvement project, the T-Hangars are to be moved to the North Airfield which would open up over 100,000 square feet of general aviation development space, as indicated in the September 2018 Environmental Assessment submitted to FAA.⁶⁴ The FAA issued a Finding of No Significant Impact (FONSI) on September 25, 2018. The Pine Hill development area is narrow and bordered by Middlesex Green office complex on

⁶⁴ Massport. September 2018. *L.G. Hanscom Field Aviation Facilities Improvements Project, Environmental Assessment*.

the west and Taxiway M on the east. Vehicle access would occur from Virginia Road as it does today. The depth of any proposed hangars would need to be compatible with the Taxiway M object free area, which is depicted on the ALP described in Section 4.2.2.

The site immediately to the south, currently occupied by Draper Laboratory, should be preserved for future aviation or aviation compatible use in the 2035 planning concept.



- | | | | |
|--|--|--|---------------------------------|
| | 2025 Planning Scenario | | Hanscom Field Property Boundary |
| | 2035 Planning Scenario | | Municipal Boundary |
| | Apron Development | | |
| | Hangar Parcel Development | | |
| | Aviation Compatible Development Parcel | | |
| | Proposed Roadway | | |

Data Sources: Massport (ALP) October 24, 2017;
 MassGIS (Roads, Rail), July 30, 2018;
 MassGIS (Community Boundaries), July 30, 2018;
 NearMap USA (Aerial) July 30, 2018

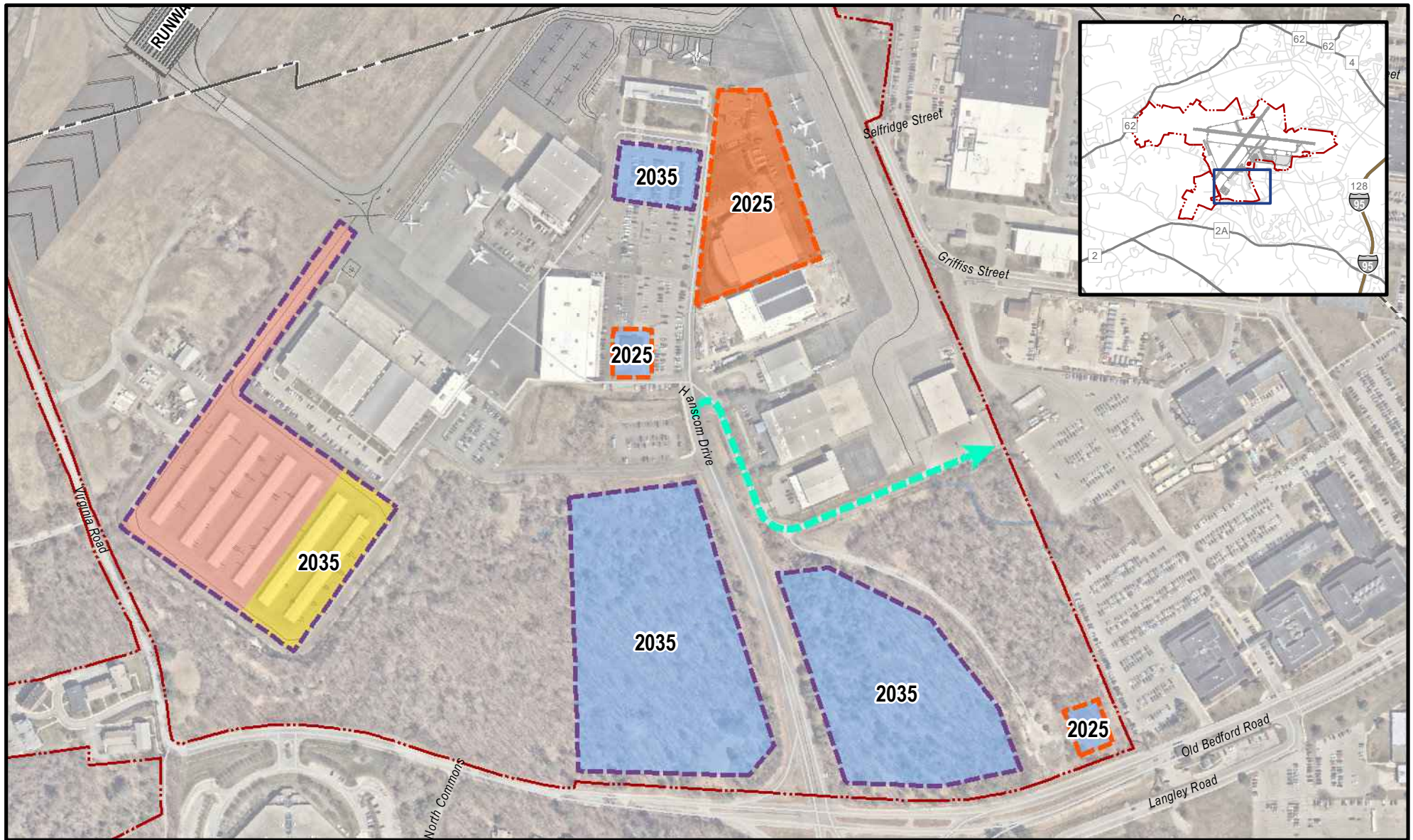


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Pine Hill Planning Concepts

Figure 4-7



- | | | | |
|--|--|--|---------------------------------|
| | 2025 Planning Scenario | | Hanscom Field Property Boundary |
| | 2035 Planning Scenario | | Municipal Boundary |
| | Apron Development | | |
| | Hangar Parcel Development | | |
| | Aviation Compatible Development Parcel | | |
| | Proposed Roadway | | |

Data Sources: Massport (ALP) October 24, 2017;
 MassGIS (Roads, Rail), July 30, 2018;
 MassGIS (Community Boundaries), July 30, 2018;
 NearMap USA (Aerial) July 30, 2018



L. G. Hanscom Field

2017 Environmental Status & Planning Report

West Ramp Planning Concepts

Figure 4-6

4.2.5 Five-Year Capital Improvement Program

Massport's five-year capital improvement program spanning from FY18 to FY23 contains various projects such as T-hangar replacement, ARFF and CBP facility relocation, taxiway and apron pavement rehabilitation, and new equipment as identified in Table 4-9. Massport would file an EIR for the projects in the capital improvement program at Hanscom Field requiring MEPA review; however, as shown in Table 4-9, none of the projects in the five-year plan are anticipated to require such review.

Table 4-9 Current Hanscom Field Planning Initiative Projects

Planning Area	Current Planning Initiatives/Projects	Timing	MEPA Review	NEPA Review ¹
North Airfield	Rehabilitation of Taxiway R	FY20	None anticipated	CatEx ² unless extraordinary circumstances exist
	Rehabilitation of Taxiway N	FY21	None anticipated	CatEx unless extraordinary circumstances exist
	Replacement T-Hangars from Pine Hill	FY19	None anticipated	EA Aviation Facilities Improvement Project, Sept. 2018
	New corporate hangars	FY18-19	None anticipated	EA Aviation Facilities Improvement Project, Sept. 2018
East Ramp	Joint Repair	FY18-20	None anticipated	CatEx unless extraordinary circumstances exist
	Pavement Rehabilitation	FY19	None anticipated	CatEx unless extraordinary circumstances exist
	Rehabilitation of Taxiway B		None anticipated	CatEx unless extraordinary circumstances exist
	New ARFF and CBP Facilities	FY18-20	None anticipated	CatEx Issued
	Hangars 1, 2, and 3 Feeder and Distribution System Replacement	FY18	None anticipated	CatEx unless extraordinary circumstances exist
West Ramp	Old T-Hangar Replacement, Rows A, B, C	FY18-19	None anticipated	CatEx unless extraordinary circumstances exist
	Civil Air Terminal Stormwater/ Drainage Improvements	FY18-19	None anticipated	CatEx unless extraordinary circumstances exist
	Relocation of Salt Storage Facility	FY18-19	None anticipated	CatEx unless extraordinary circumstances exist
	Rehabilitation of West Ramp Pavement	FY18	None anticipated	CatEx unless extraordinary circumstances exist

Planning Area	Current Planning Initiatives/Projects	Timing	MEPA Review	NEPA Review ¹
West Ramp (cont)	Potential FBO Redevelopment		None anticipated	CatEx or EA
	Potential Hangar Redevelopment		None anticipated	CatEx unless extraordinary circumstances exist
Pine Hill	T-Hangar Relocation	FY19	None anticipated	EA Aviation Facilities Improvement Project, Sept. 2018
	New Corporate Hangars	FY18-FY19	None anticipated	EA Aviation Facilities Improvement Project, Sept. 2018
Other	Replacement of Airfield Perimeter Fence	FY19-FY20	None anticipated	CatEx unless extraordinary circumstances exist
	Rehabilitation of Runway 5/23	FY23+	None anticipated	CatEx unless extraordinary circumstances exist
	Airfield Equipment Replacement	Ongoing	None anticipated	CatEx unless extraordinary circumstances exist
	Electrical Infrastructure	FY18-21	None anticipated	CatEx unless extraordinary circumstances exist
	Fire Protection Infrastructure	Ongoing	None anticipated	CatEx unless extraordinary circumstances exist
	Hanscom Airfield Lighting Control System	FY18	None anticipated	CatEx unless extraordinary circumstances exist
Note: 1. NEPA requirements described in FAA Order 1050.1F and FAA Order 5050.4B 2. CatEx = Categorical Exclusion; EA = Environmental Assessment. Source: Massport, <i>The State of Hanscom</i> , April 2018				

4.3 Analysis of Future Utilities

As with any airport, utilities are required to support the infrastructure and local tenants, including: potable water; sanitary sewer; stormwater infrastructure; electricity; natural gas; and telephone and communications. This section presents the potential changes in utility infrastructure that would be needed to serve the 2025 and 2035 development scenarios. In general, any improvements and new facilities specified in the 2025 and 2035 scenarios would require new connections and maintenance of the existing utility system; however, the current system capacity is expected to be sufficient to serve the proposed facilities. Further, given the volatility of historical utility data, it is not possible to produce a reasonable forecast of future utility demand. More specifically, trend analysis is not possible given wide fluctuations in the annual data, particularly with respect to water and sanitary sewer flows. Historical relationships cannot be established and independent variables are not available to enable regression analysis. That said, it can reasonably be expected that electricity usage will continue to be relatively stable in future years as the range of daily demand has remained steady between 5,000 and 6,000 kWh for the last eleven years. Similarly, natural gas daily demand has averaged 58 therms⁶⁵ for the previous 11 years, ranging between 36 and 56 therms for the most recent five years.

4.3.1 Water Supply and Demand

In the 2005 and 2012 *ESPRs*, water demands were estimated for 2010 and 2020 based on existing conditions in 2005 and the projected development scenarios. In 2005, the reported total average daily water demand was 34,800 gallons, which served as a baseline for future projections. The 2010 projection ranged from 44,100 gallons to 48,000 gallons, while the 2020 projection ranged from 59,200 gallons to 66,900 gallons. In recent years, however, water use has stayed well below both the 2005 demand and the 2010 projection. Between 2007 and 2017, the total average daily water demand fluctuated between a maximum of 24,370 gallons and a minimum of 7,570 gallons, as shown in Figure 4-8. As noted in the figure, several months of water usage were not available.

Water demand has stayed below earlier *ESPR* projections, possibly due to a decrease in the number of aircraft operations at Hanscom Field. There were approximately 170,000 operations in 2005, but only 129,000 in 2017. The future operations forecast predicts 132,000 operations in 2025, and 139,000 in 2035, both of which are below the number of operations observed in 2005 and the projected operations for the 2010 and 2020 scenarios.

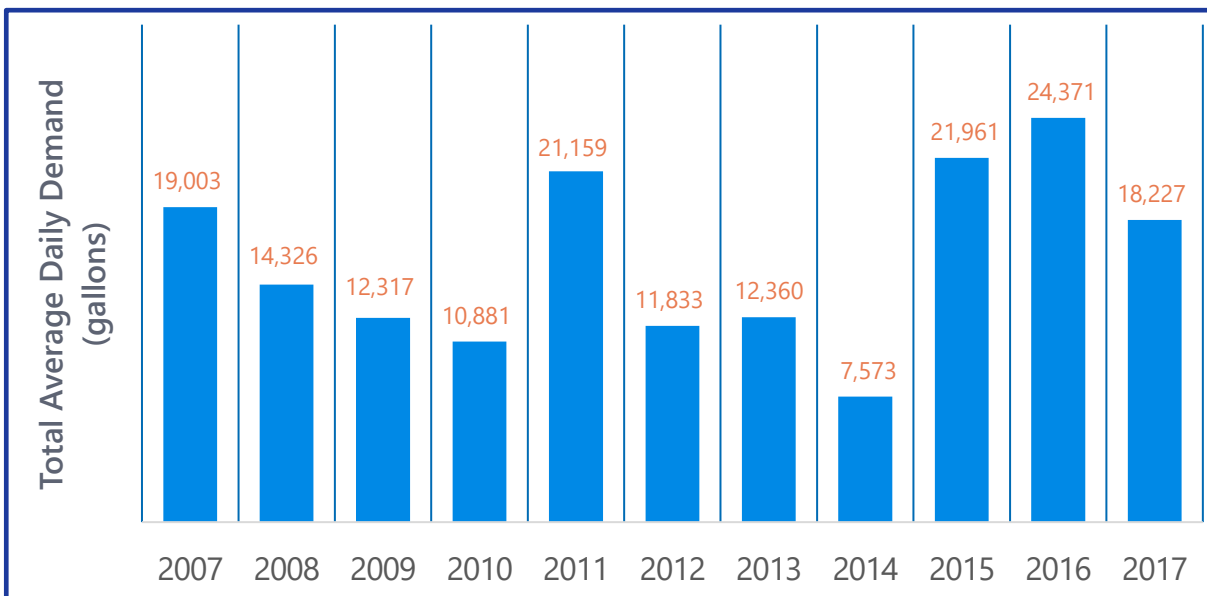
The development scenarios evaluated in this 2017 *ESPR* are of similar nature and size as the proposed improvements in the 2012 *ESPR* with a few notable exceptions. The number of based aircraft is forecast to grow at a slightly higher rate than predicted earlier. The 2012 *ESPR* projected 360 based aircraft in 2020 and 416 in 2030. The 2017 *ESPR* forecasts 376 based

⁶⁵ Therm is a unit of heat equal to 100,000 British thermal units, or BTUs.

aircraft in 2025 and 447 in 2035. The based aircraft growth focuses on business jets, requiring hangar space. Further, some projects documented in the 2012 *ESPR* are not currently under consideration by Massport, e.g. the Air and Space Museum originally slated for the northeastern corner of Hanscom Drive and Old Bedford Road/Vandenberg Drive intersection. Moreover, the National Aviation Academy no longer operates a training facility at Hanscom Field, which has also contributed to lower water usage.

Based on the existing water use, available system flow capacity, and the projected development scenarios, the existing water systems are sized to supply potable water flows required for each of the future growth scenarios. Potential new facilities in undeveloped areas would tie into the existing water lines.

Figure 4-8 Hanscom Field Water Usage, 2007-2017



Note: Data unavailable for 3/2010, 3/2011, 10/2011, 5/2013, 8/2014, 8/2015, 8/2016

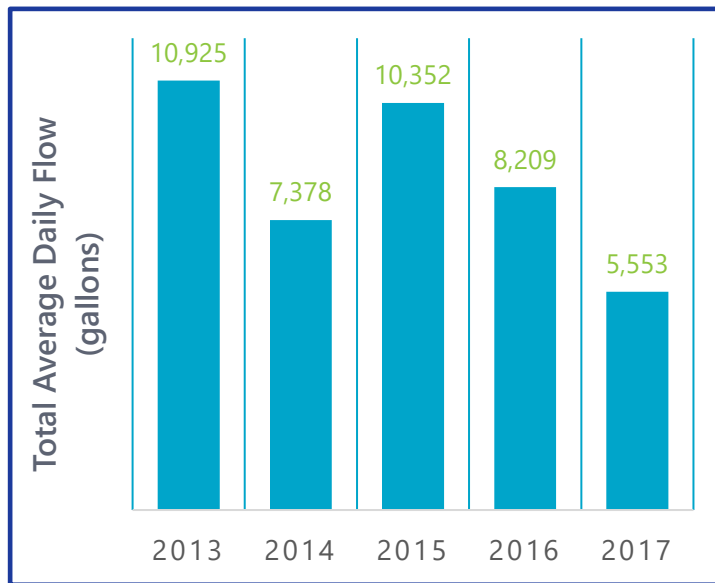
Source: Hanscom utility Data 2007-2017, Massport, 2017

4.3.2 Sanitary Sewer System

Wastewater generation in recent years has stayed below the levels analyzed in the 2005 and 2012 *ESPRs*. The total average daily flow in 2005 was 27,800 gallons per day, with future projections of 35,300 to 38,400 gallons in 2010 and 47,400 to 53,500 gallons in 2020. The greatest wastewater generation total experienced in the last five years was approximately 11,000 gallons per day in 2013, while only 5,600 gallons were generated in 2017, as shown in Figure 4-9.

The existing on-site wastewater system is expected to have the capacity to accommodate the projected growth scenarios in the 2017 *ESPR*, which are lower than the future projections in the 2012 *ESPR*. Potential new facilities would tie into the existing sewer lines. If additional capacity becomes necessary, options could include obtaining additional capacity to discharge to the Massachusetts Water Resource Authority system, mitigating increases through on-site measures such that the peak pumping rate does not exceed the fore main capacity, and/or constructing on-site septic systems meeting Title 5 requirements.⁶⁶

Figure 4-9 Hanscom Field Wastewater Generation, 2013-2017



Source: Historical Water & Sewer Volumes 2013-2017, Massport, 2017

4.3.3 Stormwater Management and Drainage System

Since the 2012 *ESPR*, approximately 9.2 acres of impervious surfaces were removed that included the Runway 11/29 shoulders, pavement at the end of Runway 5, and blast pad/stopway pavement at the end of Runway 23. Over the same time, approximately 2.3 acres of impervious areas were added as the result of Jet Aviation's new Hangar 17 and FBO facility, and the construction of the Taxiway G run up area. These changes resulted in a net removal of 6.9 acres of impervious surfaces between 2012 and 2017, as shown in Table 4-10. It is estimated that if the 2025 scenario were implemented in full, approximately 8.7 acres of new impervious surfaces could result. The 2035 scenario could add as much as an additional 56 acres for a total of approximately 64.7 acres of new impervious surfaces compared to 2012. Massport remains committed to offsetting some or all of the pavement addition on the field wherever it's practical to do so. For example, in the North Airfield EA the preferred alternative was identified in part to minimize new impervious surfaces on the airport.⁶⁷

⁶⁶ Massachusetts Department of Environmental Protection (DEP). 2018. *Title 5/Septic Systems Policies and Guidance*.

⁶⁷ Massport. September 2018. *L.G. Hanscom Field Aviation Facilities Improvements Project, Environmental Assessment*.

Table 4-10 Potential Changes in Impervious Surface (Acres) in 2025 and 2035 Scenarios

Planning Area	2025 Scenario (acres)	2035 Scenario (acres)
North Airfield	12.5	2.5
Northeast Airfield (Parcel B)	-	To be determined ²
East Ramp	0.3	1.0
West Ramp	0.5	17.2
Pine Hill	2.3	2.3
Total increase/(decrease) ³	15.6	23.0
Change since 2012 ESPR	(6.9)	(6.9)
Total increase/(decrease) since 2012	8.7	31.7
Notes: 1. Changes since 2012 include Runway 11/29 shoulder removal, and new impervious areas created by the vehicle parking areas associated with Jet Aviation's new Hangar 17 and FBO facility, as well as the addition of Taxiway G run-up area near Runway 23. 2. Development plans have not yet been determined. 3. Total acres dependent on future plans for the Northeast Airfield area.		

The potential new development projects in the 2025 and 2035 scenarios would be designed to meet the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards⁶⁸ for water quality and quantity. Stormwater at Hanscom Field outfalls to the Shawsheen River, Elm Brook and on-site wetland areas. The stormwater runoff would be treated for water quality prior to discharging into the areas. Peak stormwater runoff rates would be mitigated such that they do not exceed existing conditions. Massport continues to monitor stormwater runoff and maintains an effective stormwater management plan.

In 2017, as part of the stormwater management plan, Massport initiated a study to evaluate the existing drainage system and flooding issues associated with the Civil Air Terminal area, which includes the terminal building, the parking lot, and the surrounding roadways.⁶⁹ The study recommended increasing existing pipe diameter sizes and installing new pipes to increasing the outflows from drainage, as well as cleaning the existing drainage system between the Civil Air Terminal and Shawsheen River, and increasing the detention basin storage capacity to the maximum available. Future alternatives include providing additional outlets and two new stormwater basins adjacent to Hanscom Road outside the terminal building.

⁶⁸ Massachusetts Department of Environmental Protection. *Massachusetts Stormwater Handbook and Stormwater Standards*. <https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards>

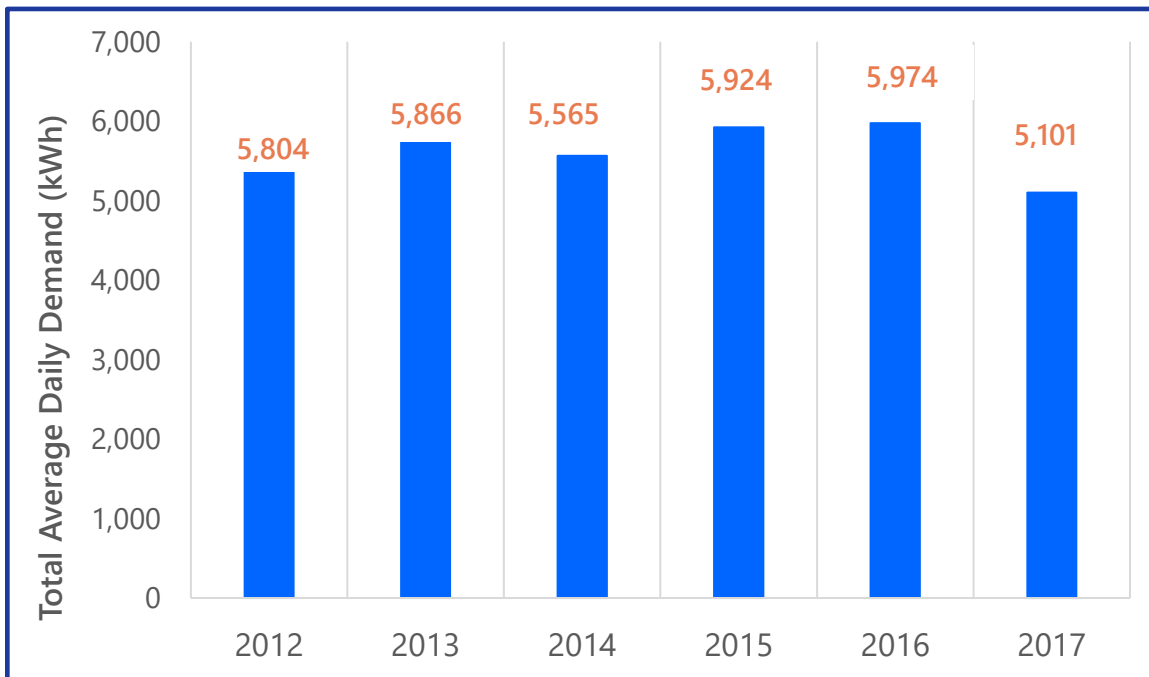
⁶⁹ Massport. 2018. *Hanscom Terminal Building Drainage Evaluation and Recommended Improvements*.

4.3.4 Electrical Distribution System

The on-site distribution system delivers electricity to all of Hanscom Field, provided by Eversource Energy. According to the 2012 *ESPR*, additional capacity and an expanded distribution system would not be necessary to support operations today, but may need to be implemented to support future growth. Massport has included upgrades to the electrical utility system as part of the five-year capital program, including the replacement of the electrical distribution system for Hangars 1, 2, and 3 and additional electrical infrastructure improvements.

The photovoltaic array on the roof of the Civil Air Terminal also generates electricity and Boston MedFlight is in the process of installing solar panels on the roof of Hangar 12A with the intent of providing nearly all of the energy needed to power the facility. As Massport continues to make smart energy investments, there is no reason to believe that the electrical distribution systems will require investment directed at provision of additional capacity. As shown in Figure 4-10, electricity usage has remained relatively stable since 2012.

Figure 4-10 Hanscom Field Electricity Demand, 2012-2017



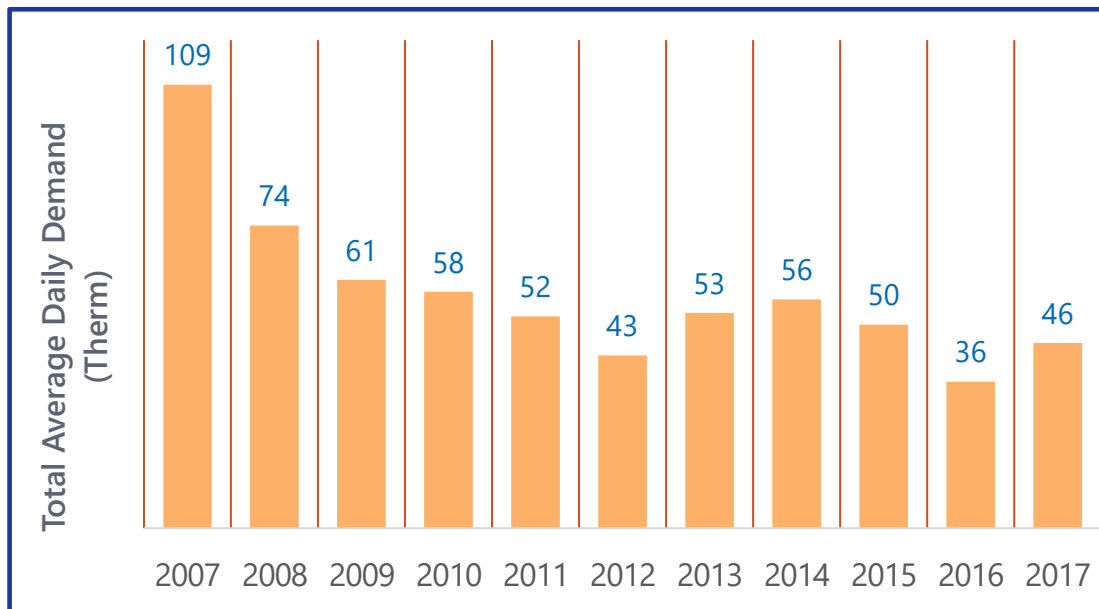
Note: Data unavailable for December 2017

Source: Hanscom Utility Data 2007-2017, Massport, 2017

4.3.5 Natural Gas

Enhancement of the natural gas distribution system occurred circa 2010 with the installation of a 4-inch high-pressure line. This condition remains unchanged for the 2017 *ESPR*. The demand in 2007 was 58 percent higher than the demand currently experienced at Hanscom.

Figure 4-11 Hanscom Field Natural Gas Demand, 2012-2017



Note: Data unavailable for October 2016
Source: Hanscom Utility Data 2007-2017, Massport, 2017

As Massport continues to improve the energy efficiency of their facilities, it is unlikely that the natural gas distribution systems will require investment directed at provision of additional capacity. As shown in Figure 4-11, natural gas usage since 2012 has remained relatively stable.

4.3.6 Telephone and Communications

As previously discussed in Chapter 2, both Comcast and Verizon provide internet and phone services at Hanscom Field. The existing telephone conduit capacities are adequate for current demand, but additional capacity and routine service upgrades may be required to provide a sufficient number of lines for the 2025 and 2035 growth scenarios.

4.4 Consistency of 2017 ESPR with Plans and Regulations

Massport is a state authority that owns and operates public-use transportation facilities that include Boston-Logan International Airport, Worcester Regional Airport, Hanscom Field, marine terminals within the Port of Boston, and a range of real-estate properties in the Boston area. Massport's goals and objectives are consistent with local plans of the towns of Bedford, Concord, Lexington, and Lincoln and regional plans such as MAPC's ongoing effort to update the regional plan for the Greater Boston area. Massport supports many of the principles described in these plans, including the creation and operation of environmentally friendly facilities, sustainability, promoting regional equity, economic development opportunities, and the efficient use of existing resources. Massport seeks to achieve these results within the context of managing public-use facilities.

Hanscom Field has existed as an airport since being constructed by the federal government in 1941. After providing primarily military service from 1941-54, Hanscom became a GA airport and control of the airfield's general operations and maintenance was transferred to Massport in 1974. Much of the infrastructure and impervious surfaces of the airfield has remained largely unchanged under Massport's tenure. However, the predominately rural, agricultural character of the area surrounding Hanscom Field continues to be transformed by increasing residential and commercial development independent of and unrelated to Hanscom Field.

Activities at Hanscom Field are consistent with local, regional, and other plans, to the extent that these plans or policies apply to Hanscom Field. The future scenarios described in the *2017 ESPR* are consistent with those that were evaluated in the *2012 ESPR*; however, the plans have been updated to reflect the current aviation demand forecast, in particular the change in the segments of the market expected to grow. The 2025 and 2035 scenarios describe potential additional aviation and aviation-related uses on the airport and retain many areas in their current, natural state. Hanscom Field continues to have a minimal effect on local traffic, air quality, water quality, and wetland resources. However, Hanscom Field remains an airfield facility and, therefore, has the accompanying effects implicit to aircraft operations, including aircraft noise. Noise analysis and mitigation are discussed in detail in Chapter 7 Noise.

Massport's plans are currently limited to those investments described in Section 4.3.5. These plans support Hanscom Field's role as a premier full-service GA airport with the potential for limited scheduled commercial passenger service. The future scenarios that were evaluated in this document present estimates of what could happen at Hanscom Field using certain assumptions, not necessarily what will happen. Should the plans associated with the future scenarios become under consideration further for implementation, Massport would study management approaches for consistency with the local and regional plans.

4.4.1 Federal and State Regulations

This *ESPR* identifies potential projects that could occur based on the aviation forecasts described in Chapter 3 Airport Activity Levels. Massport will follow applicable local, state, and federal review for any future project that triggers such reviews. For example, both the 2025 and 2035 scenarios identify additional aircraft hangar and apron facilities that would involve an update to the ALP, which in turn may require NEPA and/or MEPA review. Before proposing such changes, Massport would review NEPA and MEPA regulations and coordinate with the FAA to determine the appropriate level of review.

4.4.2 Consistency with the 1978 Master Plan and Massport's 1980 Regulations

Massport's 1978 Master Plan and 1980 regulations for Hanscom continue to guide Massport's long-range planning. The *2017 ESPR* reaffirms the role of Hanscom Field as a premier regional GA airport with the potential for limited scheduled commercial air service. While the 1978 Master Plan anticipated cargo operations at the airport and commercial air passenger services, this activity is anticipated to be minimal going forward, if present at all. The *2017 ESPR* evaluates future scenarios that include scheduled passenger service utilizing turboprop aircraft with approximately 30 seats, but did not consider cargo services given current market conditions. The 2035 scenario forecasts approximately 138,000 annual operations, which is well below the Master Plan's estimated practical capacity of 320,000 operations per year.

4.4.3 Consistency with Local Plans

In general, the plans articulated by Bedford, Concord, Lexington, and Lincoln and their planning documents address the desire to preserve the historical character and natural resources of the towns, while balancing the demands of changing social and economic conditions. Economic development, which has occurred throughout the four towns and the larger suburban area, has resulted in the associated traffic and environmental impacts experienced in the area, particularly related to population growth, which has outpaced recent forecasts of the same.

The basic use of Hanscom Field for aviation purposes takes place within a local planning and zoning context that only describes non-aviation related uses. The towns' plans do not provide for aviation-related land uses. The Commonwealth's policy is to maintain Hanscom Field as a key aviation resource. While Massport considers local planning and zoning, it is not subject to local regulations unless specified by state law.

4.4.4 Consistency with Regional Plans

The efficient use of Hanscom Field as an existing part of the region's transportation infrastructure is consistent with "Smart Growth" policies, including those outlined in MAPC's *MetroFuture*. In addition, through the *ESPR* process, Massport has identified and clearly

described potential environmental effects of future scenarios to provide a comprehensive evaluation of potential conditions that would be associated with forecasted aviation activity levels.

5

Regional Transportation



Chapter 5 Regional Transportation reviews the role of Hanscom Field in the region's broader airport and long-distance transportation system, with a brief overview of the role Boston Logan International Airport plays in the region. It provides an overview of aviation activity trends in the region for both general aviation and commercial air service, while also describing airport improvement plans for the region's airports, including:

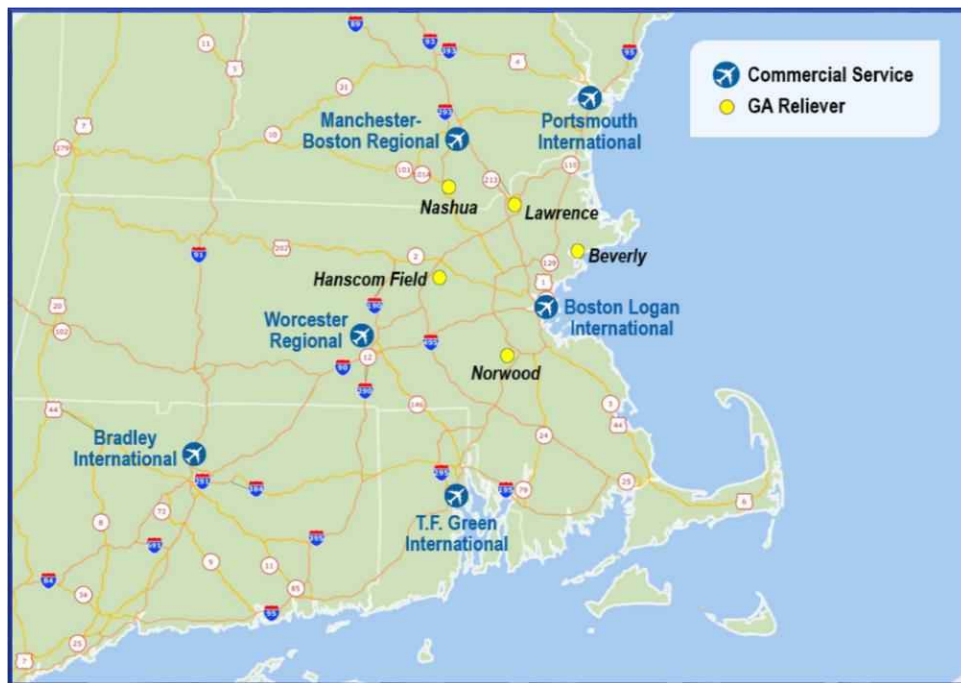
- ⇒ *Hanscom Field;*
- ⇒ *Worcester Regional Airport;*
- ⇒ *T.F. Green International Airport;*
- ⇒ *Manchester-Boston International Airport;*
- ⇒ *Bradley International Airport;*
- ⇒ *Portsmouth International Airport; and*
- ⇒ *Tweed-New Haven Regional Airport*

This chapter also describes Massport's efforts to work with other state and regional transportation agencies within a cooperative planning context to strengthen the regional transportation network. It reports on the regional transportation planning initiatives that Massport is undertaking relative to Hanscom Field, Worcester and Logan airports. Finally, this chapter provides an overview of long-range transportation planning initiatives that are currently underway in the region, and developments in both air and rail transportation infrastructure.

5.1 Key Findings Since 2012

Hanscom Field is the busiest general aviation (GA) airport in New England, and overall second busiest GA airport in the country. Hanscom Field has historically accommodated a wide variety of aviation activity, including business/corporate aviation, air taxi/private charter services, recreational and personal flying, and pilot flight training. In addition to general aviation, Hanscom Field has accommodated some limited scheduled commercial airline and light air cargo services as well as limited military flights associated with Hanscom Air Force Base (AFB). Figure 5-1 shows the relative locations of the GA and commercial airports in the Greater Boston Metro Area. In part due to its close proximity to Boston and the Route 128/I-95 and Route 495 high-tech corridors, Hanscom Field accommodates more GA activity than any other airport in the region. Hanscom Field handles over four times as many general aviation operations per year as Boston Logan International Airport (Logan Airport) and serves an important role as a reliever to Logan, alleviating demand for airfield capacity.

Figure 5-1 General Aviation and Commercial Service Airports in the Greater Boston Metropolitan Area



Changes to the regional aviation system since 2012 airport include:

- ⇒ Operations at general aviation reliever and commercial service airports in the Boston Metropolitan Area fell by 2.9 percent per year between 2012 and 2017. This decline is primarily due to higher fuel prices, declining number of student pilots and high cost of aircraft ownership.

- ⇒ Hanscom Field experienced an average 4.9 percent decline over the same period but remains the leading GA airport in the region in terms of overall GA activity.
- ⇒ Scheduled commercial passenger traffic at New England airports continued to grow during this period. From 2012 – 2017 the combined passenger traffic at New England airports increased by 4.3 percent on average annually. Much of this growth has occurred at Logan Airport. Hanscom Field has not had any scheduled commercial passenger service since 2012.
- ⇒ Boston Logan International Airport has continued to exceed historical passenger activity levels on an annual basis. In 2018 the airport handled 40.9 million passengers. This represents 70 percent of all scheduled commercial airline passengers in the region.
- ⇒ Since its peak in 2005, the market share of scheduled commercial air passenger traffic has continued to decrease at the other airports in the region. From 2012-2017, T.F. Green passenger numbers increased 1.7 percent annually, which passenger traffic at Manchester-Boston declined by 4.3 percent annually. The combined market share of scheduled commercial passenger traffic at these primary commercial relieve airports decreased from 17 percent in 2012 to 13 percent in 2017. The decrease can be attributed to consolidation of airlines at hubs such as Logan.
- ⇒ Since 2012, commercial aircraft operations at Logan Airport and New England generally grew 2.6 percent and 1.1 percent annually, respectively. Despite the retirement of many small regional jet and turboprop aircraft, airlines continued to add new service and increased the frequency of service to various markets from the region.
- ⇒ Regional airports have continued to attract new scheduled airline service. Portsmouth International Airport (Pease) for example, launched scheduled service by Allegiant Air. At Worcester Regional Airport, JetBlue commenced new services to Florida in 2013, American Airlines commenced new flights to Philadelphia starting in the fall of 2018, and Delta announced new flights to Detroit starting in 2019.

Additional information regarding improvement projects being planned or currently underway at Hanscom Field can be found in Section 5.5.1.

5.2 Role of Hanscom Field in the Regional Airport Network

The following section describes the roles of Hanscom Field, Worcester Regional Airport and Logan Airport and the manner in which Massport has promoted a successful regional airport network.

5.2.1 Role of Hanscom Field

Hanscom Field serves as the premier full-service general aviation facility for Massachusetts and New England. The airport accommodates a variety of corporate and private general aviation activities, as well as air taxi/charter, and public service operations that might otherwise use

Boston Logan International Airport. Hanscom Field's role as a GA reliever with limited scheduled commercial service was established in the airport's 1978 Master Plan and clarified in Massport's 1980 Regulations for Hanscom Field. These plans restrict scheduled commercial passenger services to aircraft with 60 seats or less, though.

Hanscom Field has not had scheduled passenger commercial service since 2012. The ability of Hanscom Field to provide more significant air passenger services is also affected by its proximity to the region's commercial service airports including Logan, Worcester, T.F. Green, and Manchester-Boston.

5.2.2 Role of Boston Logan International Airport

By virtue of its location in New England's population and commercial center, Logan Airport is the region's dominant airport for scheduled commercial airline service. Logan Airport is New England's largest and busiest airport with flights to destinations across the U.S., Canada, Central and South America, Europe, Asia, and the Middle East. Logan Airport also provides more than 50 daily departures to small and/or remote communities including Cape Cod and the islands as well as markets in northern New England and upstate New York, connecting these communities to the national air transportation network.

Logan Airport is also the largest cargo airport in New England and the 28th largest in the nation in terms of cargo moved in the U.S. The airport accommodated 452,000 metric tons of air freight and mail through its facilities in calendar year 2017.⁷⁰

5.2.3 Role of Worcester Regional Airport

Worcester Regional Airport is an important part of the transportation network and economic development of the central Massachusetts region, with Worcester being the second largest city in New England. The airport is located approximately 50 miles west of Boston. It accommodates both scheduled commercial airline service and corporate GA activity.

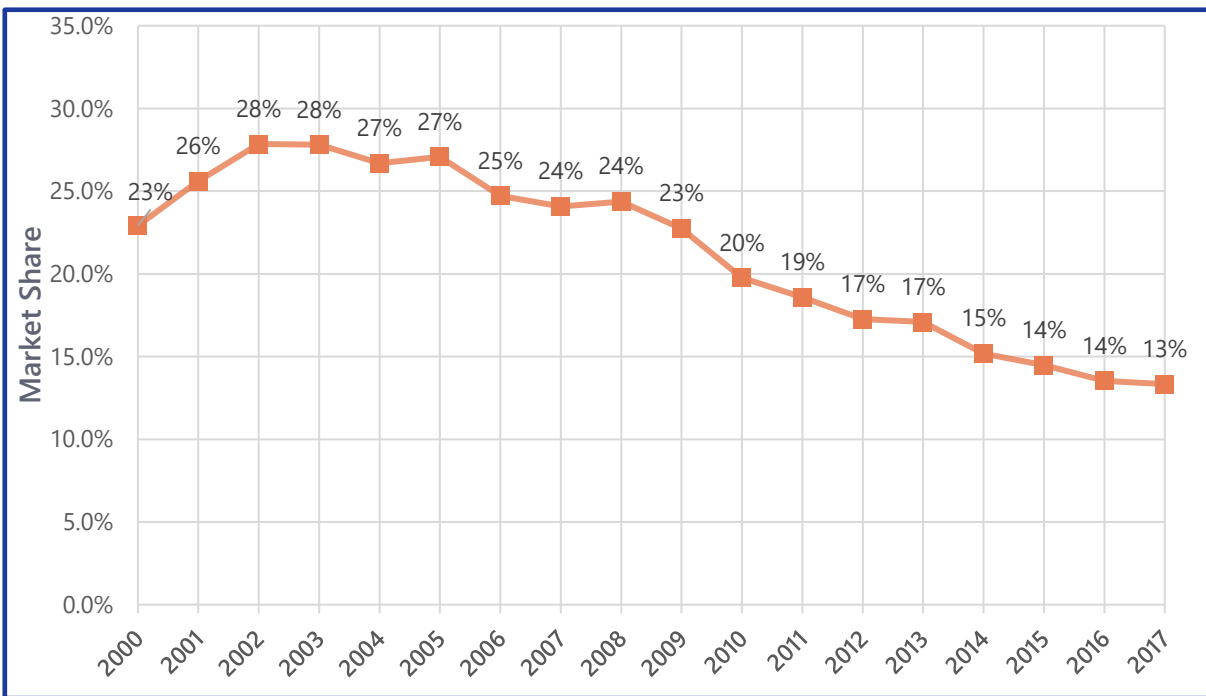
Massport acquired the airport from the City of Worcester in 2010 and it continues to invest in modernizing facilities and working with airlines to expand scheduled commercial service from Worcester. Since JetBlue began service in 2013, the carrier has served more than 500,000 passengers. Massport actively markets the air service at Worcester Regional Airport as an additional commercial service airport in the region that can conveniently accommodate passengers in central MA and west of Boston, while simultaneously alleviating congestion at Logan.

⁷⁰ FAA Air Carrier Activity Information System (ACAIS), Qualifying Cargo Airports, Rank Order, and Percent Change from 2016, 2018

5.2.4 Massport's Efforts to Support Regional Airport Network

The regional airports that are closest to Logan and have the greatest influence on its passenger traffic and aircraft activity are Worcester Regional Airport in Worcester, Massachusetts, T.F. Green International Airport in Providence, Rhode Island and Manchester-Boston Regional Airport in Manchester, New Hampshire. Given their close proximity to Boston, relative ease of access, as well as scheduled service to an array of markets, these airports serve as the primary alternatives to Logan. Massport's efforts to promote commercial service at the Worcester Regional Airport have recently succeeded in bringing three major carriers to that airport by late 2019.

Figure 5-2 T.F. Green, Manchester-Boston, and Worcester Combined Share of Boston Area Passengers



Note: Market share represents T.F. Green, Manchester-Boston, and Worcester passengers as a percent of total T.F. Green, Manchester-Boston, Worcester Regional, and Logan Airport passengers.

Source: Massport Airport Statistics, T.F. Green Airport Statistics, Manchester-Boston Airport Statistics

An increase in scheduled passenger service and the introduction of service from low cost carriers such as Southwest Airlines resulted in these secondary airports accommodating a higher share of the region's commercial air passengers in the early 2000s. As shown in Figure 5-2, T.F. Green, Manchester, and Worcester airports together accounted for more than 25 percent of total passengers in the combined market area in the early 2000s. This market share declined to approximately 24 percent in 2007 and has been steadily decreasing ever since. In 2017, these three airports accounted for 13 percent of total market area, less than half of their

historical peak. Worcester Regional Airport has recently experienced a significant increase in commercial service; more than 500,000 passengers have been served by JetBlue at ORH since their flights began in 2013.

T.F. Green and Manchester lost approximately 2.8 million passengers between 2003 and 2017, whereas Logan Airport gained 15.6 million passengers in the same period. One of the reasons for this passenger trend is that competition in secondary markets, combined with efforts to consolidate operations at large hubs, led to renewed activity in large hub airports. Southwest entered the Boston market in 2009, while JetBlue grew its presence at Logan Airport significantly in the past seven years.

As noted above, despite these trends, Massport has been successful in actively promoting air service activity at Worcester Regional Airport as a way to reduce congestion at Logan Airport. As a result of these efforts, JetBlue began non-stop services to Orlando International and Fort-Lauderdale-Hollywood airports in 2013, starting with one daily departure to each destination. As of 2017, JetBlue increased the frequencies to two daily departures to both Orlando and Fort-Lauderdale. In addition, JetBlue began flights to New York JFK starting in May 2018, American Airlines began flights to Philadelphia beginning in October 2018, and Delta announced a new non-stop daily flight to Detroit starting in August 2019.

5.2.5 Expected Future Role of Hanscom Field

As part of its regional approach, Massport is committed to maintaining Hanscom Field as a vital link in the transportation infrastructure of Massachusetts and New England. Hanscom Field will continue to function within the regional airport network primarily as a GA reliever to Logan Airport and as the region's premier, full-service general aviation and business aviation airport with the possibility of limited scheduled commercial passenger service.

5.3 Regional General Aviation Activity Trends

In 2017, Hanscom Field handled roughly 128,000 general aviation operations, approximately 29 percent of all general aviation operations in the region. This is compared to approximately 164,000 GA operations at Hanscom in 2012. Hanscom Field remains the busiest general aviation airport in the region, handling almost twice the operations as the second busiest general aviation airport, Norwood Memorial Airport, and four times as many general aviation operations as Logan Airport in 2017. Table 5-1 compares general aviation operations at Hanscom Field to other general aviation reliever and commercial service airports in the greater Boston metropolitan area.

Overall, general aviation operations in the greater Boston metropolitan area fell by an average of 3.0 percent per year between 2012 and 2017, which is a slightly greater decline than the national trend. General aviation operations at U.S. airports with Federal Aviation Administration (FAA) contract traffic control services declined 0.4 percent per year from 2012 to 2017.⁷¹ This decline in general aviation operations is less pronounced than it had been in the years leading up to 2012, but the demand for general aviation continues to weaken as personal flying becomes more expensive and the number of student pilots remains depressed relative to historical levels. In spite of the downward trend in operations, 2017 did produce an increase in piston aircraft sales, while business jet sales remained steady compared to previous years.

As shown in Table 5-1, general aviation activity declined at Hanscom Field by an average of 4.9 percent per year between 2012 and 2017, about twice the rate of the region. Most of this decline is due to a decline in what the FAA defines as local operations, which are operations that remain within the local area (e.g., flight training activity, simulated instrument approaches). Among other airports in the region, general aviation operations at Logan Airport grew the fastest at an annual average rate of 2.1 percent per year, while general aviation operations at Worcester Regional Airport experienced the greatest decline at an annual average rate of 10.2 percent per year. General aviation growth at Logan Airport is primarily attributed to business aviation. The decline at Worcester Regional Airport, similar to at Hanscom Field, is due mostly to a decline in local operations.

⁷¹ FAA. FAA Aerospace Forecast Fiscal Years 2018-2038.

https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2018-38_FAA_Aerospace_Forecast.pdf

Table 5-1 Operations at General Aviation Reliever and Commercial Service Airports in the Boston Metropolitan Area

Airport	NPIAS Category ¹	General Aviation Operations ²		CAGR ³	Percent Local 2017	Number of Based Aircraft 2017
		2012	2017			
Hanscom Field	Nonhub primary	164,834	128,018	-4.9%	36.0%	370
Norwood Memorial	Nonprimary reliever	68,405	66,823	-0.5%	36.2%	118
Nashua/Boire Field	Nonprimary reliever	55,620	56,352	0.3%	52.4%	251
Beverly Municipal	Nonprimary reliever	58,203	53,401	-1.7%	49.3%	102
Laurence Municipal	Nonprimary reliever	52,157	36,822	-6.7%	41.3%	213
Portsmouth International (Pease)	Nonhub primary	38,132	36,717	-0.8%	71.5%	143
Boston Logan International	Large hub	28,144	31,120	2.1%	0.0%	-
Worcester Regional	Nonhub primary	44,070	25,683	-10.2%	32.6%	75
T.F. Green	Small hub	26,274	24,797	-1.2%	36.1%	37
Bradley International	Medium hub	15,589	13,233	-3.2%	1.8%	65
Manchester-Boston Regional	Small hub	12,504	13,169	1.0%	21.0%	67
Total		563,902	486,135	-2.9%	38.6%	1,441

Notes:

1. The National Plan of Integrated Airport Systems (NPIAS) includes all commercial service airports, all reliever airports, and selected public-owned general aviation airports.

2. Operations include itinerant air taxi, general aviation, and local civic operations. Manchester-Boston Regional, T.F. Green, and Bradley International Airport operations exclude air taxi operations as their operations counts are comingled with regional commuter airline operations.

3. Compound Annual Growth Rate

Sources: FAA Traffic Flow Management System Counts (TFMSC), FAA Terminal Area Forecast (TAF); Hanscom Field and Logan International Airport counts are provided by Massport.

5.4 Regional Commercial Service Trends

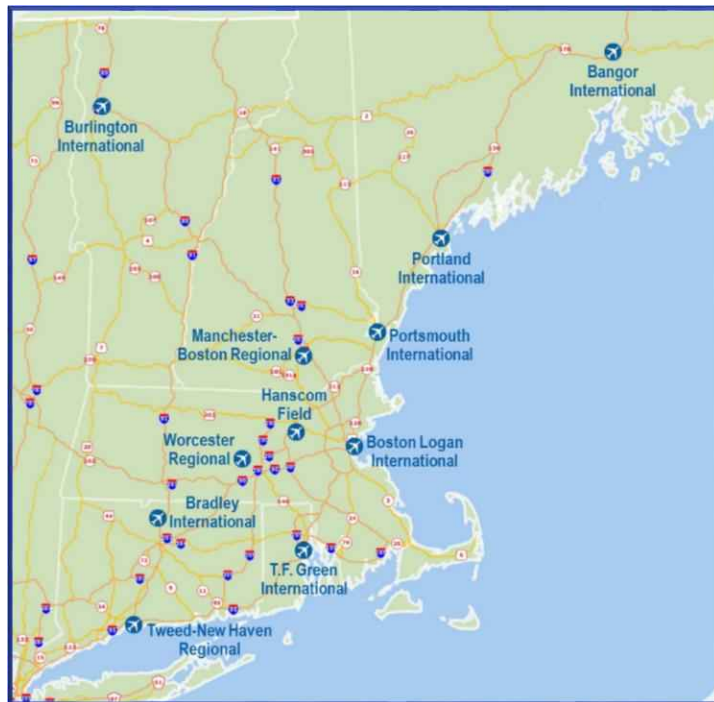
The region's air passengers are primarily served by a network of commercial service airports throughout New England. Figure 5-3 depicts the location of the airports that are included in the FAA's New England Regional Airport System Plan (NERASP): Bangor International Airport, Boston Logan International Airport, Bradley International Airport, Burlington International Airport, Hanscom Field, Manchester-Boston Regional Airport, Portland International Jetport, Portsmouth International Airport, T.F. Green International Airport, Tweed-New Haven Regional Airport, and Worcester Regional Airport.

5.4.1 Commercial Airline Trends in the Region

The largest commercial service airports in the New England region experienced strong growth since the late 1990s. Southwest Airlines, for example, expanded services through the region's secondary airports rather than at Logan Airport, introducing services at T.F. Green International Airport, Manchester-Boston Regional Airport, and Bradley International Airport. At the end of the 2000s, this trend began to shift as Southwest initiated service at Logan Airport in 2009 and reduced service at the other airports in the region. Since 2012, other airlines have also shifted the focus away from growing activity at the secondary regional airports.

Logan Airport experienced rapid passenger and operations growth in recent years. Southwest almost doubled its daily departures from 35 in 2012 to 66 in 2017, while JetBlue grew from 94 daily departures in 2012 to 136 daily departures in 2017. Boston Logan International Airport is not dominated by any one airline in terms of passenger market share. In 2017, JetBlue had approximately 27 percent share of total passengers, followed by American Airlines at 18 percent, Delta Air Lines at 16 percent, United Airlines at 10 percent, and Southwest at eight percent.⁷² In addition, international airlines (e.g. Emirates, Qatar Airways, Norwegian Air, Scandinavian Airlines, Cathay Pacific, Hainan Airlines, COPA, and

Figure 5-4 New England Regional Airport System Plan



⁷² U.S. DOT T-100, 2017

TAM) have added several new non-stop destinations to Europe, the Middle-East, Asia, and Central America. These new international destinations also attracted long-haul low-cost carriers to the region (e.g. Norwegian Airlines).

Ultra-low-cost carriers (ULCCs) have added service to secondary airports in the region, with a focus at T.F. Green, which gained new European services offered by Norwegian Airlines and new domestic services offered by Frontier Airlines and Allegiant Airlines. These new carriers compensated for the loss of traffic that was a result of Southwest's shift of focus from secondary airports.

Worcester Regional Airport and Bradley International Airport experienced passenger traffic growth in recent years. Worcester attracted new nonstop services by JetBlue as well as to Philadelphia by American Airlines and in 2019 to Detroit by Delta Air Lines, while Bradley International grew by approximately one million passengers from 2012 to 2017, despite a small decrease in scheduled commercial operations. This is primarily due to airlines up-gauging from regional jet and turboprop aircraft to mainline narrow-body aircraft. At Bradley, average seats per aircraft increased from 97 to 115 over this time.

5.4.2 Commercial Airline Passengers

Table 5-2 presents the change in commercial airline passenger levels at Logan Airport, Hanscom Field, and other New England commercial air service airports between 2012 and 2017. Over this period, combined passenger traffic at the ten secondary regional airports increased by a rate of 1.6 percent per year. In contrast, at Logan Airport passenger traffic grew by a rate of 5.5 percent per year. Passenger traffic at Hanscom Field ceased in 2012 (hence the 100 percent decrease shown in the table). The current passenger operations at Hanscom are mostly charter flights and all are comprised of non-scheduled service.

Logan Airport's passenger traffic reached an all-time peak of 40.9 million in 2018, which represented over 70 percent of the region's airline passengers. As mentioned previously, new airline service contributed to Worcester's, T.F. Green's and Portsmouth's growth, whereas Manchester-Boston continued to see a decline of passengers due to airlines adjusting frequency and aircraft size to match market demand and meet profitability goals.

Table 5-2 Passenger Activity at Logan Airport, Hanscom Field and Other New England Commercial Service Airports

Airport	Airport Code	Passengers (millions) ¹		CAGR	2012 Passenger Share	2017 Passenger Share
		2012	2017	2012-2017		
Logan Airport, MA	BOS	29.33	38.41	5.5%	66.3%	70.5%
Bradley International, CT	BDL	5.32	6.44	3.9%	12.2%	11.8%
T.F. Green International, RI	PVD	3.62	3.94	1.7%	8.2%	7.2%
Manchester-Boston, NH	MHT	2.45	1.97	-4.3%	5.5%	3.6%
Portland International, ME	PWM	1.67	1.86	2.2%	3.7%	3.4%
Burlington International, VT	BTV	1.23	1.16	-1.3%	2.8%	2.1%
Bangor International, ME	BGR	0.46	0.49	1.4%	1.0%	0.9%
Worcester Regional, MA	ORH	0.03	0.11	32.0%	0.1%	0.2%
Portsmouth International, NH	PSM	<0.01	0.10	99.6%	0.1%	0.2%
Tweed-New Haven Regional, CT	HVN	0.08	0.06	-5.2%	0.2%	0.1%
Hanscom Field, MA	BED	0.01	-	-100.0%	0.0%	0.0%
Subtotal Regional Airports		14.88	16.12	1.6%	33.7%	29.5%
Total		44.19	54.52	4.3%	100.0%	100.0%
Notes:						
1. Includes scheduled commercial, charter, and other non-scheduled passengers.						
Source: Massport and U.S. Department of Transportation T-100 via Diio						

5.4.3 Commercial Airline Operations

Passenger airline operations are summarized in Table 5-3 for airports in the FAA's NERASP (operations refer to aircraft takeoffs and landings). Logan Airport remained the busiest in 2017, growing 2.5 percent per year between 2012 and 2017, handling over 370,000 scheduled passenger operations in 2017 (approximately 66 percent of such operations, and 70.5 percent of the passenger share in the region.) At the other ten airports, collective commercial operations declined slightly at a rate of 1.0 percent per year between 2012 and 2017. However, a few of those airports experienced growth. Bangor International Airport experienced approximately a 2 percent increase in scheduled airline operations. Worcester Regional and Portsmouth International airports accommodated new airline service.

While passenger numbers have increased at many of these airports, overall aircraft operations have declined due to increasing load factors (the percentage of seats occupied on the aircraft) and the introduction of larger aircraft into the markets. Further the retirement of small regional jets and turboprop aircraft is expected to continue despite fuel prices dropping in recent years.

Scheduled commercial passenger activity has not been present at Hanscom in recent years; the last operator, Streamline Air, ceased operations in 2012 and no new operators have since initiated service.

Table 5-3 Commercial Airline Operations at Logan Airport, Hanscom Field and Other New England Commercial Service Airports

Airport	Airport Code	Scheduled Commercial Airline Operations ¹		CAGR	2012 Operations Share	2017 Operations Share
		2012	2017	2012-2017		
Logan Airport, MA	BOS	326,755	370,251	2.5%	61.2%	65.8%
Bradley International, CT	BDL	67,396	65,225	-0.7%	12.6%	11.6%
T.F. Green International, RI	PVD	45,698	39,973	-2.6%	8.6%	7.1%
Manchester-Boston, NH	MHT	27,553	27,352	-0.1%	5.2%	4.9%
Portland International, ME	PWM	32,070	24,555	-5.2%	6.0%	4.4%
Burlington International, VT	BTV	22,744	21,582	-1.0%	4.3%	3.8%
Bangor International, ME	BGR	8,808	9,882	2.3%	1.6%	1.8%
Worcester Regional, MA	ORH	2,606	1,929	-5.8%	0.5%	0.3%
Portsmouth International, NH	PSM	3	1,371	240.4%	0.0%	0.2%
Tweed-New Haven Regional, CT	HVN	2	678	220.7%	0.0%	0.1%
Hanscom Field, MA	BED	635	0	-100.0%	0.1%	0.0%
Subtotal Regional Airports		207,515	192,547	-1.5%	38.8%	34.2%
Total		534,270	562,798	1.0%	100.0%	100.0%

Notes:

1. Does not include charter and other non-scheduled operations.

Source: U.S. Department of Transportation T-100 via Diio Mi, Scheduled Passenger Operations

5.5 Regional Airport Improvement Plans and Projects

The following section describes airport improvement projects being planned or currently underway at the regional airports in light of the commercial service trends and the roles of the Massport airports as described in the previous sections. The plans described are in response to the aviation industry trends playing out at the region's airports.

5.5.1 Hanscom Field, Bedford, MA

Massport continues to invest in Hanscom Field to improve and upgrade facilities and maintain a safe, secure and efficient airport. Past and future capital investments ensure that Hanscom can continue to serve its role as a general aviation reliever to Logan and as the premier business aviation facility for the region. Hanscom's five-year capital improvement program spanning from Massport's fiscal year

Planned Massport Hanscom Field capital projects for fiscal year 2018 and beyond:

- ⇒ Improvements to civil air terminal drainage;
- ⇒ Replacement of salt storage enclosure;
- ⇒ Replacement of Hangars 1, 2, and 3 electrical feeder and distribution systems;
- ⇒ Repair of East Ramp pavement;
- ⇒ Rehabilitation of Taxiway N and R;
- ⇒ Rehabilitation of pavement on West ramp;
- ⇒ Rehabilitation of Runway 5/23;
- ⇒ Replacement of airfield perimeter fence sections;
- ⇒ Planning and permitting for the 2019-2023 VMP Update; and
- ⇒ Replacement of T-Hangar Rows A-C.

2018 to fiscal year 2023 contains a variety of maintenance and improvement projects in addition to projects recently completed or currently underway.

Ongoing or expected third-party projects at Hanscom Field include:

- ⇒ Construction of Boston MedFlight new facility, Hangar 12A, in place of the old National Aviation Academy facility. The new facility, which incorporates hangar space, office space, and training spaces, was completed in 2018.
- ⇒ T-hangar relocation and new general aviation aircraft hangar development on Pine Hill.
- ⇒ Replacement T-hangars and new general aviation aircraft hangar development on North Airfield.

In addition to the federal funding sources for capital improvements (e.g., FAA Airport Improvement Program funding), Massport solicits third-party development of facilities that support and enhance Hanscom's role in the regional transportation system.⁷³ Many of the

⁷³ Local tax revenue is not used to fund improvements at the airport

hangars at Hanscom Field are owned or leased by tenants who are responsible for maintaining them. Chapter 4 Airport Planning contains more information about other improvements under consideration at Hanscom Field.

5.5.2 Worcester Regional Airport, Worcester, MA

Worcester Regional Airport has undertaken many maintenance and improvement projects since Massport assumed operational control of the airport. Most importantly, in 2017, Massport upgraded the Runway 11 landing system from Category I to Category III, to allow for low-visibility operations in inclement weather conditions. The new landing system, which became fully operational in 2018, enables landings in nearly all weather and visibility conditions, thereby enhancing the airport's ability to attract new commercial service.

Ongoing capital projects at Worcester Regional Airport:

- ⇒ Rehabilitation of Taxiway B between Runway 29 and Taxiway F;
- ⇒ Upgrading of the water pump station;
- ⇒ Upgrading fire protection and fire alarms;
- ⇒ Replacement / repair of airfield equipment; and
- ⇒ Installation of new electric equipment. The FAA awarded a \$463,000 grant for new equipment that can provide power and air conditioning for aircraft parked at Gates 1 and 2 at the airport. This allows the aircraft to shut off their on-board auxiliary power units, thereby reducing emissions.

Other planned projects for Worcester Regional Airport are listed below:

- ⇒ Rehabilitation of Runway 15-33 pavement.
- ⇒ Replacement of Runway 11 and 29 runway safety area engineered materials arrestor system (EMAS).
- ⇒ Rehabilitation of Runway 11 pavement.
- ⇒ Relocation of Runway 11/29 distance remaining signs.
- ⇒ Installation of two new passenger boarding bridges.

5.5.3 T.F. Green International Airport, Warwick, RI

The Green Airport Improvement Program was initiated by T.F. Green International Airport in 2011 to lengthen the primary Runway 5/23 by about 1,500 feet to a total of 8,700 feet and to enhance the safety areas around Runway 16-34. The FAA conducted an Environmental Impact Statement (EIS) and issued a Record of Decision allowing for the airport to implement the project. The lengthened Runway 5/23 enables coast to coast and long-range international flights from Providence. Work on the runway extension began in 2013 and was completed in

October 2017. As part of the project, a park was relocated, and a public roadway was realigned to allow for the longer runway and its associated safety areas.

Other airport improvement plans and projects at T.F. Green include:

- ⇒ Demolition of Hangar 1 in 2013, and paving the site to provide additional aircraft parking.
- ⇒ Installation of a system for the collection and treatment of deicing fluids in 2015.
- ⇒ Improvements to the Runway 16 runway safety area were completed in 2014. As part of this project, an engineered materials arrestor system (EMAS) was installed to quickly slow down and stop aircraft in case of an aircraft overrun at the end of the runway.
- ⇒ Acquisition of a new 1,500-gallon Airport Rescue and Firefighting (ARFF) vehicle is planned in late 2018.
- ⇒ Other runway improvements and wetland protection projects (the FAA awarded \$500,000 toward acquiring easements for a runway).
- ⇒ Renaming the airport to Rhode Island International Airport, reflecting the airport's recent addition of international services.

5.5.4 Manchester-Boston Regional Airport, Manchester, NH

Since the early 1990s, Manchester-Boston Regional Airport has invested over \$500 million to improve and develop landside and airside facilities and infrastructure at the airport. Projects included: a 158,000 square foot passenger terminal and two subsequent 75,000 square foot terminal expansions; a 4,800-space parking garage with an elevated pedestrian walkway connection to the terminal; roadway improvements; and extensive runway reconstruction. In 2003, Runway 35 was extended from 7,000 feet to 9,250 feet to allow for non-stop services to Las Vegas and other West Coast destinations. Recent and on-going improvements at Manchester-Boston Regional Airport include:

- ⇒ Rehabilitation of the concrete apron adjacent to the terminal building, completed in 2013.
- ⇒ Opening of a new 11,000 square foot consolidated rental car facility in 2016. The facility is home to eight car rental agencies.
- ⇒ Completion of a passenger-flow improvement project in 2016. The project included the construction of a new, six-lane, consolidated passenger screening checkpoint and the renovation of the existing terminal atrium to allow for more efficient flow of passengers. Lights, flooring, and aesthetics were also upgraded.
- ⇒ Reconstruction of Taxiway H and relocation of Taxiway B in 2017.
- ⇒ Realignment of two additional taxiways, planned to begin in 2018. The project will require a two-year construction period.

5.5.5 Bradley International Airport, Windsor Locks, CT

A \$200 million airport modernization project at Bradley International Airport was completed in 2010. As part of this program, Terminal A was expanded with a new concourse; ticket counters, gates, and waiting areas were renovated; and an international arrivals building was also constructed.

In 2011, the Connecticut Airport Authority (CAA) was established to oversee the operation and development of Bradley International Airport. The goal of the CAA is to transform Bradley and the state's five general aviation airports (Danielson, Groton/New London, Hartford-Brainard, Waterbury-Oxford, and Windham) into economic drivers for the state. Since the CAA took over operations in 2013, several airport development projects have been completed or are underway including:

- ⇒ Completion of a sound insulation project in 2013. There were 249 neighboring homes that met certain criteria and received sound insulation.
- ⇒ Rehabilitation projects for taxiways at multiple locations around the airfield (Taxiway C and R).
- ⇒ Development of a new state-of-the-art ground transportation center. In the fall of 2014, the Bradley Development League initiated an alternatives analysis and feasibility study to improve public transportation connectivity and accessibility between Bradley International Airport and the New Haven-Hartford-Springfield rail line. As part of this project, the old Terminal B (Murphy Terminal) building was demolished to make space for the ground transportation center.
- ⇒ Completion of a three-year renovation project of the airport hotel in 2011.
- ⇒ Completion of the terminal food court renovation project in 2013.
- ⇒ With new flights introduced to Canada and Europe, opening of a duty-free shop in 2016 for international passengers.

The CAA is also planning a \$1.4 billion renovation at Bradley as part of the 20-year master plan, which includes a new Terminal B connected to the current Terminal A, an onsite car rental center with 830 vehicle parking spaces, and modifications of roadways and roundabouts for smoother traffic flow on the airport.

5.5.6 Portsmouth International Airport, Pease, NH

Portsmouth International Airport is a commercial service airport in the Seacoast region of New Hampshire and also home to several general aviation and flight training facilities, as well as the New Hampshire Air National Guard. A significant number of aircraft operations are generated by refueling aircraft and cargo freighters. It is currently served by Allegiant Air, while Frontier Airlines will begin service in December, 2018.

Current airport improvement projects include both military and civilian projects. Upgrades are being made to accommodate the new KC-46A Pegasus air refueling aircraft, which will replace

the Air National Guard's aging KC-135 fleet. In addition, the airport is planning to upgrade one of the runway approach systems to a Category-III instrument landing system.

Additional future airport improvement projects in the seven-year capital improvement plan include:

- ⇒ Additional improvements of airside and landside infrastructure, including a terminal expansion.
- ⇒ Maintenance and rehabilitation of apron, taxiway, and runway pavement.
- ⇒ Renovation of parking lots.
- ⇒ Improvements to airport access roadways.
- ⇒ Airport planning, environmental, and specialty studies.

5.5.7 Tweed-New Haven Regional Airport, New Haven, CT

Tweed New Haven, the smaller of the two airports in Connecticut with regularly-scheduled passenger service, currently has flights offered by American Airlines. The airport has identified the existing runway length to be a constraining factor for attracting new airlines business, and has been seeking approval to extend the runway from 5,600 to 6,600 feet.

Recent or ongoing airport improvement projects include:

- ⇒ Residential sound insulation program for properties surrounding the airport.
- ⇒ Construction of wildlife hazard deterrent fence.

5.6 Regional Airport Improvement Plans and Projects

This section reports on state and regional planning efforts to achieve a balanced regional intermodal transportation network to reduce reliance on Logan Airport and provide travelers with a greater range of long-distance, intercity transportation options.

5.6.1 Regional Aviation Economic Impact Study

The aviation industry and airports comprise a significant element of Massachusetts's economy. The FAA and the Massachusetts Department of Transportation (MassDOT) continue to invest in airport infrastructure to improve and enhance economic development opportunities. MassDOT published the *Massachusetts Statewide Airport Economic Impact Study* in 2011, which was updated in 2019, summarizing the economic benefits that Massachusetts derives from its public-use airports. The study describes how the local economy builds on aviation and enumerates the other benefits that air transportation provides to its host communities.

The study found that Massachusetts public use airports generate \$24.7 billion in total economic activity, including \$7.2 billion in total annual payroll resulting from 199,237 jobs that can be traced to the aviation industry. In particular, Massport's three airports are noted to make significant contributions to the regional economy, generating approximately \$23.1 billion (94 percent) of the overall economic benefits generated by the Massachusetts airport system. Specifically, Logan Airport supported over 162,000 jobs in Massachusetts with a total economic impact estimated at approximately \$16.3 billion per year. Worcester Regional Airport supported 587 jobs with a total economic impact of \$96.7 million. Hanscom Field is particularly important for its function as the airfield for

Hanscom AFB, an active military facility, which is aided by its proximity to Boston-area technology and research industry. Hanscom Field alone supports 2,243 jobs and generates \$680 million in economic activity, but combined with Hanscom AFB, the two entities together support 19,587 jobs and have a total economic impact of \$6.7 billion. For every \$100 spent by aviation-related businesses, an additional multiplier impact of \$56 is created within Massachusetts, according to the study.⁷⁴ While the economic impact of the region's airports was the focus of the study, it also noted qualitative benefits of the state's airports.

Qualitative benefits of the state's airports include:

- ⇒ Facilitating emergency medical transport;
- ⇒ Providing police support;
- ⇒ Supporting aerial surveying, photography and inspection operations;
- ⇒ Supporting U.S. military and other government operations; and
- ⇒ Providing youth outreach activities.

5.6.2 Massachusetts Statewide Airport System Plan (MSASP)

Airports are an essential element of Massachusetts' intermodal transportation system, and the MassDOT Aeronautics Division (formerly the Massachusetts Aeronautics Commission or MAC) is responsible for being an effective steward for the state's 39 public use airports (nine commercial service airports, 30 general aviation airports). In 2009, the MassDOT initiated development of the Massachusetts Statewide Airport System Plan in order to provide an assessment of current conditions and long-term development of the statewide airport system as a whole. The technical report was published in 2010 and it provides an inventory of the existing facilities, current airport roles, aviation demand forecast, adequacy of existing and future systems, as well as the financial needs and recommendations.⁷⁵ The report recommends that MassDOT Aeronautics Division update the system plan in five-year increments, but an update in the 2015-2016 timeframe has not yet been published.

⁷⁴ Massachusetts Statewide Airport Economic Impact Study Update, January 2019, Massachusetts Department of Transportation

⁷⁵ https://www.mass.gov/files/documents/2018/02/08/TechnicalRpt_1_Entire.pdf

5.6.3 Boston Region Long-term Transportation Vision

Massport is member of the Boston Region Metropolitan Planning Organization (MPO). The Boston MPO developed a long-range vision for the region and its transportation network out to the year 2040, which was published in 2015. An update of the *Long-Range Transportation Plan* (LRTP), *Charting Progress to 2040*, is expected in 2019.⁷⁶ In a departure from prior long-range plans, *Charting Progress to 2040* will balance the need for regionally significant roadway-improvement projects with projects that will improve transit, bicycle, and pedestrian access. The plan focuses on six goals: safety, preservation, mobility, environment, transportation equity, and economic vitality.

5.6.4 Statewide Long-term Transportation Vision

MassDOT released the Commonwealth's Long-Range Transportation plan in 2014, called *weMove Massachusetts: Planning for Performance*. This report provides a summary of MassDOT's approach to multimodal capital planning and the use of scenario planning. The report analyzes several key components of the transportation system: bridges, roadways, buses, trains, and bicycle paths to provide a data-driven decision-making methodology to assist MassDOT in implementing its priorities transparently and measurably. Along with the report, a Planning for Performance tool was also published that can be used to calculate the performance outcomes that would result from different levels of funding available.

Massport was an active participant in the development for the MassDOT's Rail Plan and Freight Plan. The *Massachusetts State Rail Plan*, published in 2018, is the Commonwealth's 20-year plan for the state's rail system. It describes a set of strategies and initiatives aimed at enhancing rail transportation so that it can effectively fulfill its critical role in the state's multimodal transportation network.⁷⁷ MassDOT's vision for passenger and freight service is to strategically look for opportunities to better serve the Commonwealth over the next 20 years.

The *Massachusetts Freight Plan*, which was also published in 2018, describes the important role that Logan plays in the air transport of freight and the important connections with highway and railways networks.⁷⁸ Out of the 39 public-use airports in Massachusetts, Logan Airport is by far the largest in terms of passenger and freight traffic. Massport continues to explore opportunities to increase air cargo attractiveness at Worcester Regional Airport. Given the activity at Logan and the commercial service at Worcester, air cargo at Hanscom Field is unlikely to occur. MassDOT's long-term rail freight rail projects include plans to extend the freight rail from the New Bedford Secondary Line to the New Bedford Airport. This added service would support intermodal connections between freight rail and cargo transported via air.

⁷⁶ <http://www.ctps.org/lrtp>

⁷⁷ <https://www.mass.gov/service-details/rail-plan>

⁷⁸ <https://www.mass.gov/service-details/freight-plan>

The intercity rail system connects Massachusetts with other parts of the Northeast region and relieves demand for air service and requisite terminal capacity at Logan Airport. The Northeast Regional and Acela service allow Logan Airport to optimize its limited aircraft gate capacity for long-haul and international flights rather than short trips to other northeast corridor cities. For example, ridership on the Acela trains from Boston to New York is 50 percent higher than via air travel, which reduces the need for short haul flights between Logan Airport and New York's system of airports.

In 2018, the Massachusetts Bay Transportation Authority (MBTA) unveiled a future investment plan, entitled *Focus 40*, to meet the public transportation needs of the region by 2040. The plan includes a new downtown superstation connecting multiple subway lines (e.g. Blue Line and Red Line), possible extension of the existing subway lines (Blue, Green, and Orange Lines), new fleets of trains and buses, and a new fare collecting system. *Focus 40* aims to position the MBTA to make investments that will create a reliable, robust, and resilient transit system in the region. Also in 2018, the MBTA launched a 2-year, \$3 million study, called Rail Vision, to identify cost-effective strategies for the commuter-rail system. The study is expected to identify what infrastructure upgrades would be needed to expand service, improve existing commuter lines, and to increase ridership outside of peak commuting times.

5.6.5 New England Regional Airport System Plan (NERASP)

The New England Regional Airport System Plan (NERASP) is the product of more than a decade of work by the New England Airport Coalition, a collaboration of 11 of the region's major airports, the six New England state aviation agencies, the Massachusetts Port Authority, the New England Council, and the FAA. The results of this study provide a foundation of a regional strategy for the airports with air service to support the needs of passengers through 2020.⁷⁹

The New England state aviation officials, in partnership with the FAA, also conducted a study of the general aviation airports in New England, including primary commercial service airports, titled *The Evolving Role of Our General Aviation Airports and Their Significance to New England*.⁸⁰ This report, published in 2015, provides a greater understanding of airport roles and aviation services for their communities and states, the resources required to maintain the existing runway and taxiway infrastructure, and both a short-range and long-range perspective on the future performance of the New England general aviation system.

5.6.6 Coalition of Northeastern Governors (CONEG)

The Coalition of Northeastern Governors (CONEG), a non-partisan association of the governors of the seven northeastern states, provides support to the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP). NEG/ECP is a formally established body which coordinates regional policy programs including the areas of economic development,

⁷⁹ https://www.faa.gov/airports/new_england/planning_capacity/airport_system_plan/

⁸⁰ <http://www.pvdairport.com/documents/planning%20docs/neraspgasummarybrochure.pdf>

transportation, environment, energy and health. Members include the governors of the six New England states, and Canadian premiers of Quebec, Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador.

In 2012, the New England Governor's Conference was absorbed into the Coalition of Northeastern Governors. The CONEG recognizes the unique characteristics of the Northeast's transportation system and focuses its priority transportation initiatives on the region's intercity and commuter passenger rail system and surface transportation network. The 42nd Conference of New England Governors and Eastern Canadian Premiers was held in Vermont in August 2018. Sessions focused on energy storage, electric vehicle innovation, tourism, and trade in the region. During the conference the region's two leading international airports, Boston Logan and Montreal Trudeau were highlighted as key gateways to Asian tourism in particular, with services offered to China, Hong Kong, and beyond.

5.7 Regional Transportation Developments

This section provides updates on both rail and ground access improvements in Boston and the airports in the surrounding region.

5.7.1 Rail Transportation Improvements

This subsection reports on recent developments and current long-distance rail service originating in Boston, the status of air-rail linkages in the Northeast Corridor, and the expanding Pilgrim Partnership, which provides commuter rail between Massachusetts and Rhode Island.

Amtrak Northeast Corridor High-Speed Rail

Amtrak's Northeast Corridor (NEC) is a 457-mile intercity rail line that operates between Boston-South Station and Washington, DC via New York City. Other major destinations served by the route include Providence, Rhode Island; New Haven, Connecticut; Philadelphia, Pennsylvania; and Baltimore, Maryland. Logan Airport passengers can connect directly to Boston-South Station via Silver Line bus rapid transit (BRT) service or via taxi. Amtrak operates two services between Boston and Washington, DC: the Acela Express (high-speed, limited-stop service) and the Northeast Regional (lower-speed service that makes local stops along the route). A total of 19 daily departures are offered from Boston-South Station to Penn Station in New York, of which about half are Acela Express. Most trains continue south to Washington, DC, and a smaller number of Northeast Regional trains continue further south to Newport News, Virginia.

System-wide Amtrak ridership was 31.7 million one-way trips in its fiscal year 2017, which ended September 2017. The NEC represented 38 percent of total system-wide Amtrak ridership. In fiscal year 2017, the NEC carried 12 million passengers, an increase of one percent

over fiscal year 2016. Acela Express accounted for nearly 3.4 million passengers, while the Northeast Regional accounted for 8.6 million passengers. Amtrak's share of the Northeast total passenger market has increased substantially since the introduction of Acela service in 2000. Amtrak captures more than half of the total air/rail market between Boston and New York, up from 20 percent in 2000, before the introduction of Acela. Several developments and trends have contributed to Amtrak's ridership growth including the introduction of Wi-Fi, high gas prices, overall growth in business travel along the corridor, and traveler frustration with increasing highway congestion and the inconveniences of airline travel.

Northeast Corridor Infrastructure Master Plan and Next-Generation High Speed Rail Plan

The *Northeast Corridor Infrastructure Master Plan*, a new regional rail planning study, was released in May 2010.⁸¹ This master plan documents NEC growth needs through 2030, including expanded capacity and improvements in Boston-New York and New York-Washington intercity travel times. A 76 percent increase in rail ridership from 13 million to 23 million, a 36 percent increase in train movements from 154 to 210 average weekday, and the need for \$52 billion in additional capital investment is expected over the next 20 years.

Following up on the release of the *Northeast Corridor Infrastructure Master Plan*, Amtrak also unveiled a next-generation high-speed rail proposal in September 2010 titled *A Vision for High-Speed Rail in the Northeast Corridor*. The proposal outlines a brand-new 426-mile two-track corridor running from Boston to Washington, offering high-speed rail service with sustained maximum speeds of 220 mph. The route would allow for an 84-minute trip time between Boston and New York and a three-hour trip time between Boston and Washington. Under this high-speed rail plan, the New York City – Boston market could see a further shift from auto and air to rail due to the dramatic improvements in rail travel times, and the plan projects the air market between the two city-pairs to be nearly eliminated by 2050. This plan states that the traveler shift to high speed rail would reduce delays on competing modes, and the shift away from short-haul flights would free up air transport capacity for higher-value transcontinental and international flights.

An update to the *Northeast Corridor Infrastructure Master Plan* and *A Vision for High-Speed Rail in the Northeast Corridor* was released in July 2012.⁸² Since these two documents were released, the two programs have been integrated into a single, coherent service and investment program, called the Northeast Corridor Capital Investment Program. The *Northeast Corridor Capital Investment Plan: Fiscal Years 2017 to 2021* would advance the near-term projects outlined in the Master Plan to benefit the NEC while incrementally phasing improvements to the Acela high-speed service to support the next-generation high-speed rail proposed. The near-term NEC improvements are identified to occur between 2012 and 2025 and the long-

⁸¹ <https://nec.amtrak.com/wp-content/uploads/2017/08/Northeast-Corridor-Infrastructure-Master-Plan.pdf>

⁸² http://www.gcpvd.org/wp-content/uploads/2012/07/Amtrak_Amtrak-Vision-for-the-Northeast-Corridor.pdf

term next-generation high-speed rail improvements are identified to occur between 2025 and 2040. The publication of the 2012 update is the first step in “improving the NEC for all users in order to sustainably support the population and economic growth facing the Northeast over the next 30 years” but more planning work is required by all stakeholders.

Amtrak is building the foundation for its Northeast Corridor vision to enable next generation high-speed rail service with trip time reductions and trains that are more frequent. As part of the first of many phased improvements, Amtrak signed a purchase agreement for 28 next-generation high-speed trains to replace the equipment currently used for the Acela Express service. The trains will increase passenger capacity by 35 percent, cut down energy consumption by 20 percent, and will be lighter to decrease track wear and tear. The first of these trainsets is expected to enter service in 2021, and the current fleet will be retired by the end of 2022. The full build-out of the next generation vision is anticipated to be complete by 2040.

Boston-South Station Expansion

The *Northeast Corridor Capital Investment Plan: Fiscal Years 2017 to 2021* documents the investments required over the fiscal year 2018-2022 period. States, commuter railroads, and Amtrak will provide approximately \$3.3 billion over the next five years in basic infrastructure capital funding. In support of the CIP, MassDOT is designing and planning the expansion of the Boston-South Station to meet the infrastructure and capacity needs of the NEC. With over 320 daily trains, South Station is Amtrak’s third busiest station on the NEC, the busiest in the MBTA commuter rail system, and the second busiest of all the Red Line subway stations.⁸³

At present, South Station operates above its design capacity for efficient train operations and orderly passenger queuing. MBTA Commuter Rail ridership has grown 25 percent, and Amtrak ridership has grown 43 percent in the past ten years at South Station.⁸⁴ Due to limited space at the nearby Southampton Street Yard, trains are stored on station tracks, taking up space from the already limited capacity station. The passenger experience is also due for enhancements, as the station’s tracks are exposed to nature’s elements, forcing riders to travel through snow or rain to reach their trains.

The Boston-South Station Expansion projects would expand the station beyond its current capacity. Plans may include new tracks and new passenger facilities with more amenities, as well as additional storage space for MBTA trains. The project is awaiting additional funding to advance to the design and construction stages.

Amtrak Downeaster Rail Service

The Downeaster is a regional passenger rail service that is managed by the Northern New England Passenger Rail Authority and operated by Amtrak. The service links Boston’s North

⁸³ NEC Capital Investment Plan 2018-2022

⁸⁴ MassDOT, South Station: A Growing Demand for Expansion, 2018

Station to Brunswick, Maine with 10 intermediate stops. The full extension to Brunswick opened in late 2012. Five daily roundtrips are operated between Boston and Portland, Maine and three trains continue on to Brunswick. The Downeaster expects to make five round trips per day on its entire line as soon construction of a secondary passing rail line in Falmouth and Cumberland, called Royal Junction Siding, is completed. Expanded service could start as early as 2019.

In Amtrak's fiscal year 2017, ending September 2017, ridership on the Downeaster increased by 5.2 percent over the prior year to more than 526,000 passengers. The 2017 ridership was below the peak ridership seen in fiscal year 2014 when average gas prices were more than \$1.30 per gallon higher. Amtrak's fiscal year 2018 ridership is expected to continue to increase from the 2017 level.

Initial approval was given by the Northern New England Passenger Rail Authority board to trial and extension of Downeaster service from Brunswick to Rockland during the summer of 2018, but plans were discontinued when Amtrak was unable to conduct a risk assessment of the 58 miles of track along the route. Amtrak is planning to reevaluate service along this proposed route in 2019.

Pilgrim Partnership Commuter Rail Services

The Pilgrim Partnership is an arrangement between the MBTA and the Rhode Island Department of Transportation (RIDOT), under which RIDOT allocates some of its federal funding to the MBTA in return for commuter rail service between Boston from Rhode Island. Twenty daily (weekday) round-trips are provided between Boston and Providence. Expanded commuter rail service to T.F. Green Airport in Warwick, RI was introduced in 2010. Travel time between Boston and Warwick is approximately 1 hours and 25 minutes, and eight of the 20 daily Boston-Providence departures currently continue on to Warwick. Expanded service to Wickford Junction Station in Kingstown, RI commenced in 2012.

This extended commuter rail enhances ground access options from the Boston metropolitan area to T.F. Green Airport. Based on the NERASP Study, the passenger catchment areas of T.F. Green and Logan Airport overlap, and this new commuter rail service has the potential to attract passengers in the overlapping catchment area living along the Providence/Stoughton MBTA commuter rail line to T.F. Green Airport.

The Pilgrim Partnership Agreement continues through a series of amendments between the two agencies, which also includes providing rail service for special occasions, such as major sport events or airshows. In 2016, the MBTA, RIDOT, and the Rhode Island National Guard launched the Trains to Planes program. This initiative provides free rail service between Providence and Quonset during the Air National Guard Airshow.

Worcester to Boston Commuter Rail

Commuter service has grown between Worcester and Boston in recent years. In 2010, there were 12 daily round trips between Worcester's Union Station and Boston's South Station. In

2018, the daily frequency has increased to 20 round trips a day. In 2012, the Commonwealth of Massachusetts acquired the tracks between Worcester and Boston and moved the CSX freight operations from Allston to Worcester, Westboro, and West Springfield. This enabled more passenger commuter trains to operate on the line.

In 2016, the MBTA launched the “Heart to Hub” Worcester Line Commuter Rail express train, which provides service between the two cities in less than an hour. It typically operates each weekday with one morning nonstop train from Worcester to Boston and one evening nonstop train on the reverse route.

5.7.2 Airport Ground Access Improvements

This section reports on recent improvements to landside access that have occurred at the airports in the region, including Logan, Bradley, and Worcester.

Boston Logan International Airport Improvements

Massport provides frequent, scheduled, express bus service to Logan Airport for air passengers and Logan Airport employees from park-and-ride lots in Braintree, Framingham, Woburn, and Peabody (Logan Express network). Full service bus terminals and secure parking are provided at these four locations. Travel time is approximately 30-45 minutes. In 2015, a 1,100-space parking garage was opened at the Framingham station, doubling the amount of parking available. Early-bird trips have also been added to increase the ability for passengers to make early morning flights and for employees to make shift changes.

In 2014, as part of a pilot program, Massport initiated new bus service to the heart of Boston. The Back Bay Logan Express service connects Logan Airport to Boston’s Back Bay (with stops at Hynes Convention Center and Copley Square). The bus service runs on a 20-minute schedule between 5AM and 10PM and the ride takes approximately 20 minutes in normal traffic conditions, more time during rush hour periods. As of May 1, 2019, the pick-up and drop-off site will move from Copley Square to the MBTA’s Back Bay Station, and further, passengers taking the Back Bay Logan Express service will have access to the front of the security line upon arrival to the passenger terminal.

In 2013, Massport opened a new consolidated rental car facility known as a consolidated Rental Car Center (RCC), to accommodate all of the rental car companies at one single location (two of the rental car companies were previously located at an off-airport location). The facility houses a four-level parking structure for 3,200 ready, return, and storage parking spaces, a 120,000 square-foot customer service center, and four limited-maintenance service areas for rental car fleets. As part of the construction, multiple roadways were modified to improve and reduce roadway and curbside congestion. A bus access ramp was also built to support the customer terminal, and the shuttle bus system was unified to eliminate rental car shuttle buses. The new consolidated rental car facility is LEED Gold certified, and it provides 616 solar panels on its roof which produce 150 kilowatts of power.

In 2018, the U.S. Environmental Protection Agency (EPA) approved a State Implementation Plan (SIP) that increases the total number of commercial parking spaces in the Logan Airport Parking Freeze area by 5,000 parking spaces to a total of 26,088. The goal of the plan is to reduce carbon monoxide and nitrogen oxide emissions by reducing vehicle miles traveled resulting from insufficient parking at Logan Airport.⁸⁵ Permitting of the additional parking spaces is underway.

Bradley International Airport Improvements

In 2017, the Connecticut Airport Authority began construction of a new roadway system at Bradley International Airport's Route 20 entrance. The project involves the realignment of Schoephoester Road along with a portion of the airport's lower roadway system, as well as the construction of a new roundabout to handle greater traffic volume. Construction is expected to be complete in the fall of 2018.

The new roadway system will also provide access to the future development of the airport's consolidated rental car facility and ground transportation center. This new facility is expected to provide 830 parking spaces for the rental car companies, and it will eliminate shuttle buses to the rental car facilities. Construction is planned to begin in 2019.

The Connecticut Airport Authority is also in discussions to provide a shuttle service between the airport and Windsor Locks train station. With the launch of the Hartford Line commuter rail service between New Haven and Springfield, Massachusetts in 2018, more trains will stop at the Windsor Locks train station, which is located three miles away from the airport. Currently, bus service is provided only between the airport and downtown Hartford via CTtransit's 30-Bradley Flyer. The service operates hourly, seven days a week.

Worcester Roadway Improvements

The ground access infrastructure at Worcester Regional Airport does not currently inhibit the growth of air service, as passenger activity is dictated by the services offered and not the roadways leading to the airport. If robust passenger growth continues, Worcester Regional Airport's limited ground access infrastructure is expected to require improvements to maintain efficient traffic flow. Improvements have previously been made to Goddard Memorial Drive and other existing roadways. A 2013 study by MassDOT evaluated several connector roadway alternatives around I-495 and Route 9, but residential areas and wetlands would limit development.⁸⁶ The study also examined building a train station in Leicester and extending commuter service but concluded that insufficient numbers of people would use the service to justify the cost.

⁸⁵ Environmental Protection Agency, Air Plan Approval; Massachusetts, Logan Airport Parking Freeze, 2018

⁸⁶ MassDOT, Interstate 495 and Route 9 Interchange Improvement Study, 2013.

Interstate 495 and Route 9 Interchange Improvements

The area in Southborough and Westborough in the vicinity of I-495 and Route 9 have experienced significant growth in population and employment that contributed to high commuter traffic volumes and road congestion in the past years. This area is also the home of large industrial and office parks, as well as shopping centers. To ease congestion and to identify future improvements, the MassDOT initiated the *Interstate 495 and Route 9 Interchange Improvement Study* in 2011. The study involved the development and evaluation of a wide range of transportation improvement alternatives, including roadway safety improvements, braided ramps to separate merging and diverging traffic, construction of new ramps and widening of existing ramps, and realignment of existing roadways. The study also provided recommendations to reduce single occupancy vehicle traffic and to enhance public transit options via bus and rail. Recommendations of the study were published in 2013.

6

Ground Transportation



Chapter 6 describes the ground transportation system serving Hanscom Field and the relationship between the airport and that system. This chapter (1) compares current traffic data with data from the 2012 ESPR, (2) makes a retrospective comparison of existing conditions with forecasts from the 2012 ESPR, and (3) provides a prospective assessment of the 2025 and 2035 future airport activity scenarios.

This chapter presents the current transportation demand management (TDM) activities in proximity to Hanscom Field, describes current efforts to reduce single occupancy vehicle (SOV) trips to Hanscom and discusses opportunities

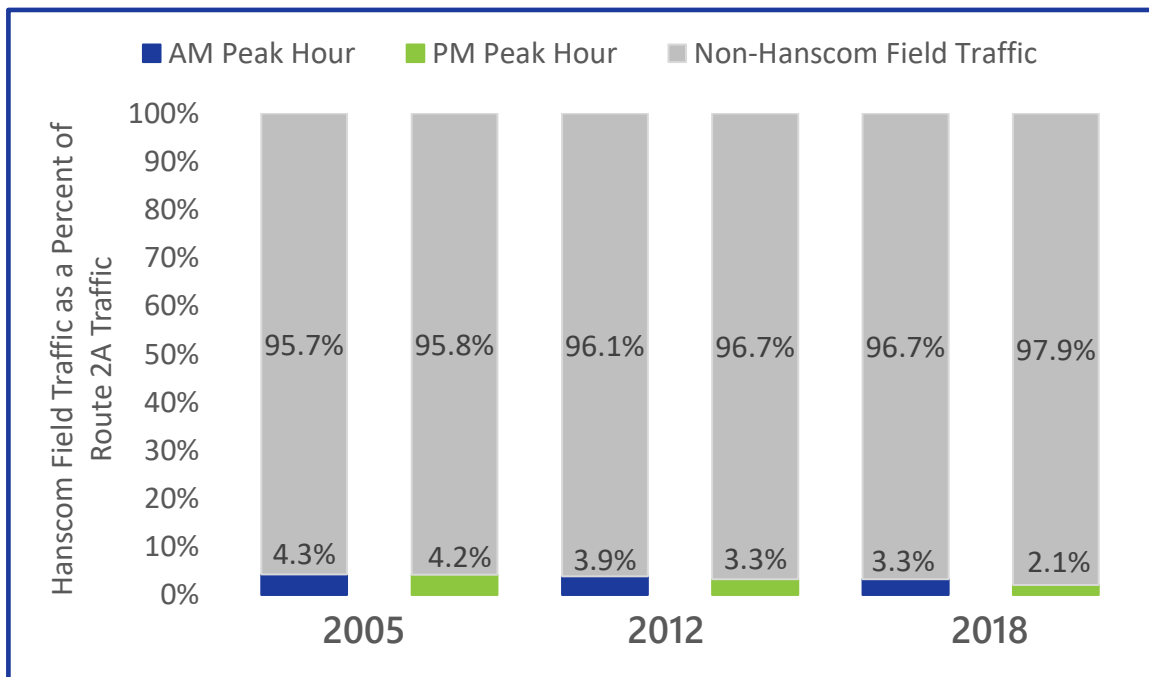
for expanding on existing demand reduction efforts.

The 2017 ESPR future scenarios were used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3 of this document. The 2025 and 2035 scenarios represent estimates of what could occur depending on demand, based on forecasted operations related to airport ground transportation in the future .

6.1 Key Findings Since 2012

Traffic in and out of Hanscom Field has traditionally occurred outside of the morning and afternoon peak traffic hours of the surrounding area. The traffic analyses conducted for this ESPR confirm that this finding has not changed since the 2012 *ESPR*. Furthermore, Hanscom Field-related traffic on surrounding roadways remains minimal in relation to other traffic present on these facilities. This analysis does not include review of traffic impacts related to Hanscom Air Force Base (AFB) – which is not included in the impact analysis of this ESPR. Based on the traffic analysis Hanscom Field-related traffic only contributes to approximately two percent of peak hour traffic volumes along Route 2A, east of Hanscom Drive. This represents a decline from the 2012 *ESPR* where Hanscom Field-related traffic contributed to between three and four percent of peak hour traffic volumes on this facility. Additionally, Hanscom Field-related traffic now contributes 10 percent or more of the total traffic at only three of the ten nearby intersections studied. This also reflects a reduction as compared to the 2012 findings. The recent relocation of the National Aviation Academy of New England off airport property has considerably reduced parking and associated vehicle trips.

Figure 6-1 Percent of Hanscom Field traffic on Route 2A East of Hanscom Drive



Note: Traffic data for the 2017 *ESPR* was collected in April, 2018. Traffic volume, vehicle occupancy, and parking demand in 2018 is likely comparable to what occurred in 2017.

Source: FHI, 2018

The traffic forecasts include vehicle trips generated by Hanscom Field, future background traffic growth, and planned developments in the area. The traffic analysis reconfirms previous *ESPR* findings that Hanscom Field is not a significant contributor to traffic volumes on the surrounding roadways, particularly during morning and evening peak hours. Commercial and residential developments, coupled with the local reliance on single occupancy vehicle (SOV), remain the most significant sources of existing and future traffic volumes on area roadways.

As Figure 6-1 indicates, Hanscom Field traffic accounts for approximately two percent of the morning and afternoon peak hour traffic volumes on Route 2A, east of Hanscom Drive, which is a reduction from the *2012 ESPR* findings. Hanscom Field traffic has decreased since 2012, while overall Route 2A peak hour traffic volumes have increased. Furthermore, due to the nature of operations at General Aviation airports like Hanscom Field, traffic activity by employees and passengers typically occurs outside of traditional peak commuting periods, because activity tends to occur either very early or late in the day, or at midday. This type of operation does not follow typical peak period commuting patterns. In addition, the employee travel survey, which implied more typical peak hour commuting patterns, accounts for only a portion of the total arriving and departing trips; a more representative measure of travel patterns for all Hanscom Field trips is illustrated by the traffic count data at driveways to Hanscom Field (see Section 6.1.4)

The average daily traffic volumes on Hanscom Drive, the primary access road to Hanscom Field from the surrounding roadways, decreased from 2,200 vehicles in 2012 to 1,700 in 2018. This extends the long-term trend seen on Hanscom Drive since 2005, as traffic volumes have declined from an observed 2,600 vehicles per day (vpd) in 2005, to the 1,700 vpd observed during the preparation of the *2017 ESPR*.

The projected increased amount of peak hour traffic volumes associated with Hanscom Field activity for the 2025 and 2035 forecast scenarios is tied to the projected increased in aviation activity described in Chapter 3 Airport Activity Levels. However, in a shift from the *2012 ESPR*, this analysis of future scenarios no longer includes the construction of a hotel or a museum on Massport property.

This traffic analysis for the *2017 ESPR* also includes trips generated at the recently-constructed Rectrix on Virginia Road in the Pine Hill area of Hanscom Field. While the peak-hour trips generated at Rectrix are minimal, the construction of this facility represents a small shift in travel patterns for trips generated by Hanscom Field. Prior to the construction of Rectrix, nearly all Hanscom Field-related traffic accessed the airport via the main entrance at Hanscom Drive. With the opening of Rectrix, however, a proportion of Hanscom Field-related traffic now accesses Hanscom Field via the entrance on Virginia Road. Additionally, the 2025 and 2035 forecast scenarios also include an increase in aviation activity; as a result, peak hour vehicle trips are anticipated to increase at both the Pine Hill area and the North Airfield area off Hartwell Road as redevelopment of those parcels is expected before 2025. Future *ESPR* documents should include these locations in the traffic count program as appropriate.

Table 6-1 Hanscom Field Vehicular Trip Generation (Vehicles per Hour)

Year / Scenario	Morning Peak Hour	Afternoon Peak Hour
2005 Actual	157	154
2012 Actual	165	121
2018 Actual	110	107
2025 Forecast	138	125
2035 Forecast	167	146
Source: 2012 Hanscom Field ESPR and FHI, 2018.		

Table 6-1 presents actual Hanscom Field peak hour trip generation since 2005 and the forecast trip generation for 2025 and 2035. As presented, the data shows a decrease in Hanscom Field-related peak hour vehicular trips since 2005. Furthermore, Table 6-1 shows projected increases to peak hour traffic volumes generated by Hanscom Field returning to similar levels to those of 2005, and does not represent a substantial increase from historical traffic volumes seen at the airport in past years.

6.2 Existing Conditions

This section describes the existing ground transportation and traffic conditions both to and from, and in the vicinity of Hanscom Field.

6.2.1 Data Collection

While the *2017 ESPR* documents Hanscom Field activities from 2012 to 2017, Chapter 6 extensively utilizes data from traffic, vehicle occupancy, and parking demand counts conducted in April 2018. The data collection period was selected in order to capture typical traffic volumes and patterns and avoid any anomalies that could result from winter storms; federal or religious holidays when many offices and schools are closed; and local school vacation weeks. Therefore, all traffic volume, vehicle occupancy, and parking demand data used for the traffic analyses in this ESPR will be labeled and referenced as 2018 data throughout this chapter. Traffic volume, vehicle occupancy, and parking demand in 2018 is likely comparable to what occurred in 2017. Data collection methods are discussed in the following sections.

6.2.2 Regional Ground Transportation Context

This section describes the regional ground transportation system surrounding Hanscom Field including: (1) the regional highway system, (2) regional rail and transit (commuter rail and local

service), (3) the regional pedestrian, bicycle and recreation network, and (4) adjacent trip generators that contribute to trip demands in the area.

Regional Highway System

A roadway network of major expressways, including Routes 128/I-95, 2, and 3, surrounds Hanscom Field (see Figure 6-2). Route 128/I-95 Exit 30 (at Route 2A) is the closest highway exit for Hanscom Field, although Exit 31 (at Route 4-225) also provides access to Hanscom Field. Route 2A, which is designated as the Battle Road Scenic Byway, provides primary east/west access to and from Hanscom Field with direct access to Hanscom Field provided via Hanscom Drive. Traffic to and from the north may approach Hanscom Field from Route 4/225 and Route 62 or from Route 128/I-95 while traffic to and from the south primarily use Route 128/I-95. Route 2 generally provides connection to areas to the west of Hanscom via Route 2A and Bedford Road. In the vicinity of Hanscom Field, most intersections are unsignalized, with the exception of Massachusetts Avenue. A left-turn lane is provided in the eastbound direction at Hanscom Drive. Traffic flows follow general commuting patterns of the area, with heavier eastbound flows toward Route 128/I-95 and Boston during the morning peak hour and heavier westbound traffic flows during the afternoon peak hour.

Regional Rail and Transit

The nearest commuter rail stations to Hanscom Field are located less than 5 miles away in Concord Center at Concord Station and in Lincoln at Lincoln Station. Both Concord Station and Lincoln Station are serviced by the Wachusett/Fitchburg Line of the Massachusetts Bay Transportation Authority (MBTA) Commuter Rail, which provides the station with 17 inbound and 17 outbound trains every weekday with service to Boston's North Station (inbound) and to Wachusett Station (outbound). Wachusett Station opened for full service on November 21, 2016. Service frequency is provided roughly every half hour in the peak hour in the peak direction only, and approximately hourly at all other times. Commuter rail service operates at Concord Station between 5:30 AM and 12:30 AM. Weekend service is provided both Saturday and Sunday with 7 trains inbound and 7 trains outbound, and with frequencies of roughly every 2 hours. Weekend service operates from approximately 7:15 AM to 12:15 AM. Currently, no shuttle or transit service is available between Hanscom Field and either Concord Station or Lincoln Station, limiting convenient access of commuter rail to commuters to and from the Hanscom Field area.

For commuters, Hanscom Field is primarily served by MBTA Bus Route 76. This route operates between Alewife Station (northern terminus of the MBTA Red Line in Cambridge), Lincoln Labs, and Hanscom Civil Air Terminal. This service operates locally between Alewife Station and the Civil Air Terminal; serving customers along Massachusetts Avenue in Lexington and those in Lexington Center before serving Hanscom Field. Furthermore, Route 76 is designed with preference to customers commuting from Alewife Station to Lincoln Labs in the morning peak hours and the reverse in the evening peak hours. This preference is implemented by servicing Lincoln Labs first on the outbound runs in the morning periods and then the reverse in the

afternoon periods. These two factors in the route design (local service and preference to Lincoln Labs) result in a commute from Alewife Station to Hanscom Civil Air Terminal that takes approximately 49 minutes in the AM Peak Hour, while the reverse commute in the PM Peak Hour takes approximately 58 minutes. This compares to roughly 30-minute peak hour service provided by the express REV BUS to and from Alewife Station and the Hartwell Road area described below. Route 76 operates between the hours 6:00 AM and 10:30 PM on weekdays, with frequency provided roughly every half hour in the morning and afternoon peak hours. Saturday service is provided on an hourly basis with a combined 62/76 route between the hours of 8:00 AM and 8:30 PM. This combined route connects Hanscom Civil Airfield with Alewife Station to the south and Bedford V.A. Hospital to the north. No MBTA bus service is provided for these routes on Sundays.

Additionally, the towns of Lexington and Bedford each operate their own transit systems, called LEXPRESS and Bedford Local Transit, respectively. Lexington's system operates on six fixed routes, each with one-hour headways, running from 6:30 AM to 6:30 PM on weekdays. LEXPRESS routes operate almost entirely within Lexington town limits; however, several of the LEXPRESS routes cross the MBTA Route 76, which services Hanscom Field. The LEXPRESS routes closest to Hanscom Field are Routes #4 and #2, which are approximately two to three miles from Route 2A and Hanscom Drive. Bedford's transit system is oriented more towards shopping trips for seniors within the town, as service is provided via a single round trip each weekday.

Another transit service in the area includes the Route 128 Business Council's REV BUS service, which provides express service for commuters of the Hartwell Avenue area in Lexington from Alewife Station. Service is provided over three peak hour trips, in a 32-passenger bus; fares are \$1 for employees of member organizations and \$3 for the public. Trip times vary between 15 minutes to a half hour, based on time of departure from Alewife Station and traffic conditions.

Furthermore, MIT and Lincoln Labs operate a private shuttle between the Lincoln Labs campus on Hanscom AFB and MIT in Cambridge. Service is provided every two hours and runs between the hours of 7:00 AM and 7:00 PM.

Regional Pedestrian, Bicycle, and Recreation Network

The Minuteman Commuter Bikeway is a 10-mile paved trail that extends from Alewife Station in Cambridge to Depot Park in Bedford. This popular trail provides direct access to the MBTA Red Line, which provides service to and from Cambridge and Boston. To the north, the Minuteman Commuter Bikeway connects to the Reformatory Branch Trail and the Narrow Gauge Rail Trail. The Narrow Gauge Rail Trail extends north three miles to Billerica via a crushed stone surface, while the Reformatory Branch Trail extends four miles to Lowell Road in Concord. The Reformatory Branch Trail is currently an improved natural surface path; however, funds have been allocated in the Boston Metropolitan Planning Organization's (Boston MPO) Transportation Improvement Program (TIP) to upgrade this trail to a paved surface for the two-mile distance between Depot Park and Wheeler Drive in Bedford in 2022.

In addition to these three trails, the six-mile Battle Road Trail, within the borders of the Minute Man National Historical Park, is also a resource for bicycle riders offering cycling, pedestrian, and wheelchair access to the National Park Service's historic and natural resources. However, these trails are not paved and do not directly link to the other regional trails. Efforts by the Town of Lexington to connect the Battle Road Trail to the Minuteman Commuter Bikeway were undertaken with the development of a conceptual plan for a 4.4-mile West Lexington Greenway plan.

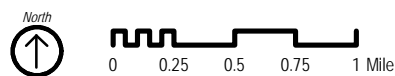
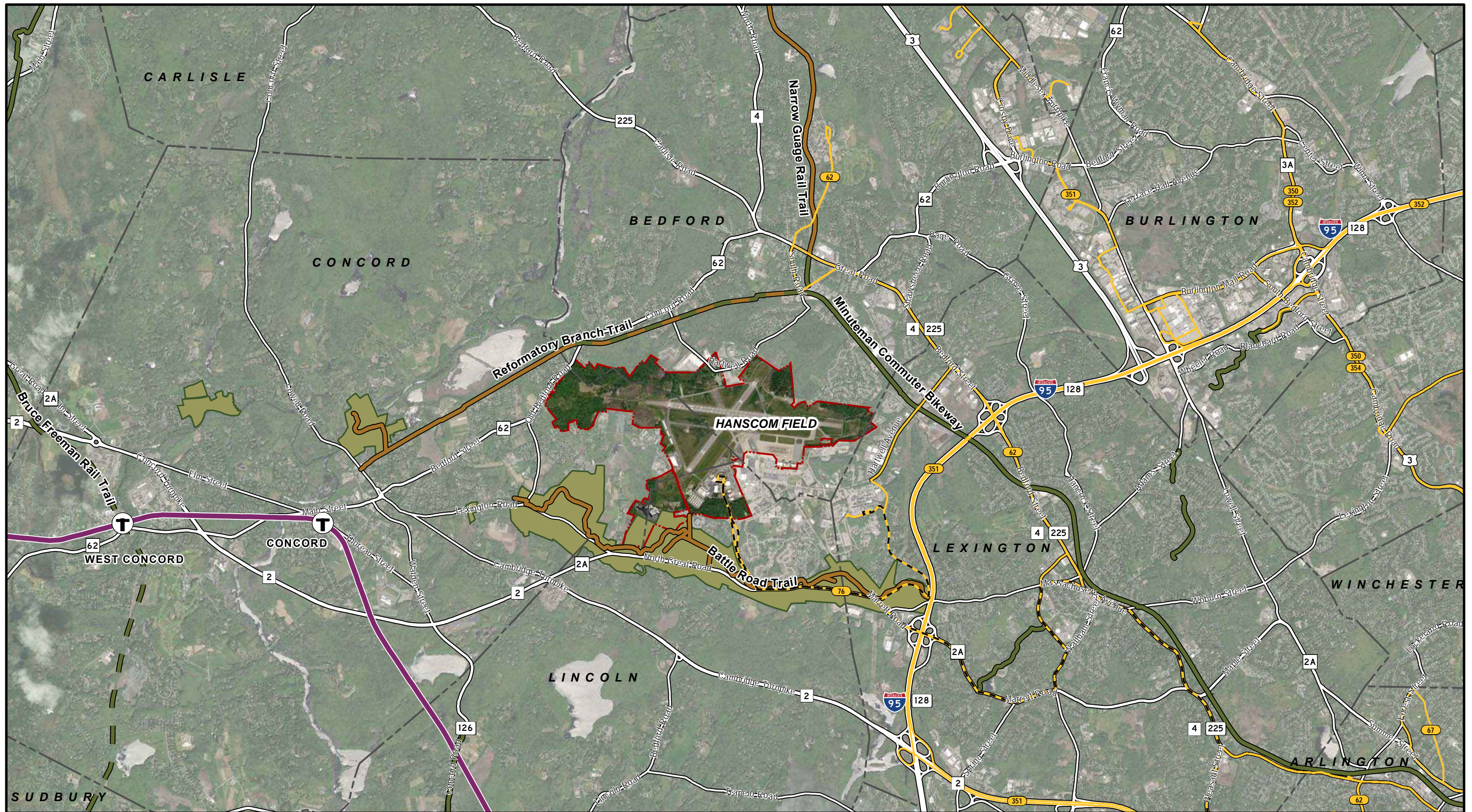
Finally, in addition to these trails, there are several on-road bicycle facilities in the towns surrounding Hanscom Field. These facilities are mostly bike lanes or unmarked shoulders. Marked bike lanes are sporadic in all four communities adjacent to Hanscom Field; however, bike lanes currently exist on Hartwell Avenue in Lexington and on Route 4 north of Lexington Center.

Adjacent Trip Generators

Hanscom Field is surrounded by other trip generators that contribute to the demands for travel on the roads, transit system, bicycle, and pedestrian network described here. This document is intended to isolate the impacts of trip generation to and from Hanscom Field in order to plan for the transportation needs associated with changes at Hanscom Field. That said, it's important to recognize the presence of adjacent trip generators in order to put the Hanscom Field operations into perspective. These adjacent generators include:

- ⇒ Hanscom AFB;
- ⇒ Numerous commercial offices and research facilities including MIT Lincoln Labs;
- ⇒ The Minute Man National Historical Park; and
- ⇒ Minute Man Regional High School.

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Data Sources: Bike Paths (MassGIS - 12/9/17, OpenStreetMaps - 9/27/18, FHI verified with aerial imagery dated 4/22/18 and government and project websites); Minute Man National Historical Park Boundary (National Park Service - 2/22/18); Municipal Boundaries (MassGIS - 3/5/13); Streets, MBTA Bus Routes, MBTA Commuter Rail (MassGIS - 7/17/2018); Aerial Imagery (ESRI)

- Hanscom Field Property Boundary
- Municipal Boundary
- Minute Man National Historical Park
- Interstate
- U.S. Highway
- State Route
- Local Road

- Paved Bike Path
- Paved Bike Path - Future
- Improved Natural Surface Bike Path
- T MBTA Commuter Rail Station
- MBTA Commuter Rail Line (Fitchburg Line)
- MBTA Bus Route 76
- MBTA Bus Route (Multiple Routes)



L. G. Hanscom Field

2017 Environmental Status & Planning Report

Hanscom Field Regional Transportation Network

Figure 6-2



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6.2.3 Regional Ground Transportation Planning Context

Regional transportation planning is primarily conducted through the Boston Metropolitan Planning Organization (MPO), which was established to direct federally-funded transportation plans and programs. The Boston MPO is responsible for prioritizing transportation projects in the region and is the key organization that programs federal transportation funding to specific projects. This section describes the structure of the MPO planning process and the key planning documents affecting ground transportation access at Hanscom Field.

In addition, other organizations such as the Massachusetts Department of Transportation (MassDOT), the MBTA, and other organizations such as the Route 128 Business Council undergo their own planning efforts, which are described in further detail below.

Boston Region Metropolitan Planning Organization

The Boston MPO region encompasses 97 cities and towns in the Boston region, including Bedford, Concord, Lexington, and Lincoln. The MPO has 22 voting members, one of which is Massport. Other voting members include other state agencies such as MassDOT and the MBTA; other regional organizations such as the MBTA Advisory Board, the Metropolitan Area Planning Council, and the Regional Transportation Advisory Council; the City of Boston; and 12 elected members from the remaining 96 cities in town in the region.

Among the most critical planning documents produced by the Boston Region MPO are the Transportation Improvement Program (TIP)⁸⁷ and the Long-Range Transportation Plan (LRTP).⁸⁸ Together, these documents prioritize and program federal transportation funds in the region, with the TIP providing project programming over the course of five years and the LRTP proving broader thematic goals in the area of transportation investment and funding over a 25-year planning horizon. Specific projects may be sponsored by organization members for consideration for federal funding, with the final list of programmed transportation projects representing a list of considered projects that have been prioritized and voted upon by the region.

The current TIP, approved by the MPO in May of 2018, includes a program of transportation funds for the years 2019-2023. The current LRTP, approved by the MPO in 2015, includes thematic goals and projects in the region for the years 2016-2040. Furthermore, each of these documents includes projects listed in a so-called “Universe of Projects” list, which identifies projects sponsored throughout the region, but not programmed in any document. Table 6-2 includes a list of relevant projects close to Hanscom Field programmed within the 2019-2023 TIP, as well as projects identified in the 2016-2040 LRTP that are not identified in the TIP.

⁸⁷ Boston Region Metropolitan Planning Organization, *Transportation Improvement Program, Federal Fiscal Years 2019-2023*, May 24, 2018. Accessed at: http://bostonmpo.org/data/pdf/plans/TIP/FFYs_2019-2023_Final_TIP_20180605.pdf

⁸⁸ Boston Region Metropolitan Planning Organization, *Charting Progress to 2040*, Accessed at: http://www.ctps.org/data/pdf/plans/LRTP/charting/2040_LRTP_Full_final.pdf

Table 6-2 Boston MPO TIP and LRTP projects relevant to Hanscom Field

MPO Planning Document	Project Title	Project Description	Status
2019-2023 TIP	Bruce Freeman Rail Trail (BFRT) Phase 2B – Acton and Concord	This proposed project would connect a 4,500-foot gap between the already completed phases of the BFRT with a pedestrian bridge over Route 2.	Currently programed for funding in 2019
2019-2023 TIP	Minuteman Bikeway Extension – Bedford	This proposed project would extend the Minuteman Commuter Bikeway by paving the existing natural surface Reformatory Branch Trail.	Currently programed for funding in 2022
2019-2023 TIP	Resurfacing on Route 2A – Concord, Lincoln, and Lexington		Currently programed for funding in 2023
2016-2040 LRTP	Middlesex Turnpike Phase 3 Improvements between Plank Street and Manning Road – Bedford and Billerica	This project involves widening a historic 2-lane arterial to a 4-lane arterial with medians and dedicated turn lanes throughout the project limits.	Under construction as of October 2018
2016-2040 LRTP	Route 4/225 and Hartwell Avenue Project – Lexington	This project involves the installation of access management controls on Route 4/225 while increasing capacity to and from Hartwell Avenue.	Planned

Projects identified in the “Universe of Projects” in both the TIP and LRTP, but not identified for funding in either plan include:

- ⇒ West Lexington Greenway – Lexington;
- ⇒ Connect the Minuteman Commuter Bikeway with the Battle Road Trail;
- ⇒ Route 2 Capacity Improvements – Acton, Concord, and Lexington;
- ⇒ Reconstruction of South Road between Washington Street and Summer Street – Bedford;
- ⇒ Reconstruction of Wiggins Avenue – Bedford;
- ⇒ Reconstruction of Massachusetts Avenue between Marrett Road and Pleasant Street – Lexington;
- ⇒ Reconstruction of Waltham Street – Lexington; and
- ⇒ Reconstruction of Hayden Avenue – Lexington.

MassDOT Planning Efforts

The Massachusetts Department of Transportation frequently engages in their own internal planning efforts to direct investment to MassDOT transportation assets across the state. These planning efforts are documented in individual plans such as the MassDOT Bicycle Plan, the MassDOT Freight Plan, the MassDOT Pedestrian Plan, and the MassDOT Rail Plan. Additionally, MassDOT is currently engaged in developing the MBTA Focus40 plan with a focus on strategies to enhance MBTA service through 2040. Review of the MassDOT Pedestrian Plan, the MassDOT Freight Plan, and the MassDOT Rail Plan does not reveal any projects that would affect access to Hanscom Field. As the MassDOT Bicycle Plan and the MBTA Focus40 are still under development, review of these documents could not be completed.

Furthermore, MassDOT is responsible for the development of the five-year Capital Investment Plan, which directs state funds to MassDOT-sponsored transportation investments. While similar to the TIP developed by the Boston MPO for the Boston region, the CIP identifies additional projects outside the scope of the TIP that do not utilize federal funds. If only state funds are used, a project may appear in the CIP while not appearing in the TIP.

Relevant projects identified in the CIP for funding between 2019 and 2023 include:

- ⇒ Minuteman Bikeway Extension – Bedford;
- ⇒ Resurfacing on Route 2 – Concord;
- ⇒ Bruce Freeman Rail Trail (BFRT) Phase 2C;
- ⇒ Reconstruction of Massachusetts Avenue between Marrett Road and Pleasant Street – Lexington;
- ⇒ Replacement of Route 126 Bridge over the B&M Railroad; and
- ⇒ Yankee Doodle Bike Path Phase 1 (extension of the Narrow Gauge Rail Trail) – Billerica.

MBTA Planning Efforts

Focus40 is the 25-year investment plan to position the Massachusetts Bay Transportation Authority (MBTA) to meet the needs of the Greater Boston Region by 2040. A draft of the Focus40 Plan was released on July 30, 2018. Review of the draft of the Focus40 plan does not indicate that any changes should be expected to directly affect Concord or Lincoln Station on the Fitchburg/Wachusett Commuter Rail Line. The MBTA Rail Vision Study is expected to be completed in 2019, and further review of these plans with respect to changes on the Fitchburg/Wachusett Line should continue to be evaluated at the time of release. Furthermore, MBTA is embarking on a multi-year effort called the Better Bus Project to reevaluate the MBTA bus network from the ground up. MBTA anticipates the study to be complete by 2020. Likewise, review of this planning study should continue as more information is released by the MBTA.

Metropolitan Area Planning Council Planning Efforts

The Metropolitan Area Planning Council (MAPC) is the regional planning agency serving 101 cities and towns in the Metropolitan Boston region. MAPC focuses much of their transportation planning efforts as part of their participation in the Boston MPO, although the organization does conduct independent studies from time to time. A review of publications published by MAPC revealed that relevant projects were limited to the LandLine-Metro Boston Greenway Network released by MAPC in spring 2018. This plan reiterates the intention to connect the Battle Road Trail to the Minuteman Commuter Bikeway to the east in Lexington Center, and to the Reformatory Branch Trail to the west in Concord Center.

Middlesex 3 Coalition

The Middlesex 3 Coalition is a regional partnership of nine Middlesex County Communities including Bedford, Billerica, Burlington, Chelmsford, Lexington, Lowell, Tewksbury, Tyngsborough, and Westford. The coalition communities share a common goal of fostering economic development, job growth and retention, diversification of the tax base, and enhancement of quality of life. Members include stakeholders in local government, business, finance, education, and development who have combined resources to promote the competitive advantages of the region and advance the economic vitality of the Route 3 Corridor.

Due to the significant amount of business development happening along the Route 3 Corridor, traffic and transportation resources continues to be a top priority for the Coalition. Several transportation-related efforts undertaken by the Coalition include:

- ⇒ The Middlesex 3 Transportation Sub-committee was created as a way for members to collaborate and strategize methods for tracking transportation issues in member communities.
- ⇒ The Middlesex 3 Transportation Community Compact was received in 2015; it allows the Coalition to work with the state and transportation agencies to evaluate current

public transportation services in the area and develop recommendations for improvements to services that fail to meet current and future transportation demand.

- ⇒ The Middlesex 3 Transportation Management Association (M3TMA) was formed in 2014 to address transportation issues such as traffic congestion and to improve air quality in the region. The M3TMA offers transportation resources to public or private businesses, educational institutions or residential institutions.

Hanscom AFB Planning Efforts

Hanscom AFB is currently expected to conduct improvements at the Vandenburg Gate at Old Bedford Road which is expected to include gatehouse relocation and improvements to the intersection of Hanscom Drive and Old Bedford Road. In a US Army Corps drawing dated May 2018, key modifications include the installation of a single-lane roundabout at Hanscom Drive and Old Bedford Road with Hanscom AFB bound traffic on the northbound leg separating from through traffic via a free-flow right turn ramp to the gatehouse. In addition, the southbound right turn ramp from Hanscom Drive to Old Bedford Road is expected to remain. All other movements will be made via a single lane entry or exit at the roundabout. Construction is expected to be completed before the 2025 scenario year and the roundabout design is utilized in reporting 2025 and 2035 capacity results in later sections. A copy of the US Army Corps drawing from May 2018 is included in the appendix.

Other Organizational Planning Efforts

The Route 128 Business Council was established in 1987 as Massachusetts' first Transportation Management Association (TMA) to provide alternative transportation services to the Route 128 corridor between Route 2 and Route 20. Since their establishment, they have expanded to the Hartwell Avenue area and provide direct shuttle service between Alewife Station (MBTA Red Line) and member businesses. Due to logistical challenges, it is not likely feasible to extend one of the existing shuttles to serve Hanscom Field; however, service continues to evolve at the direction of the TMA's members and their needs.

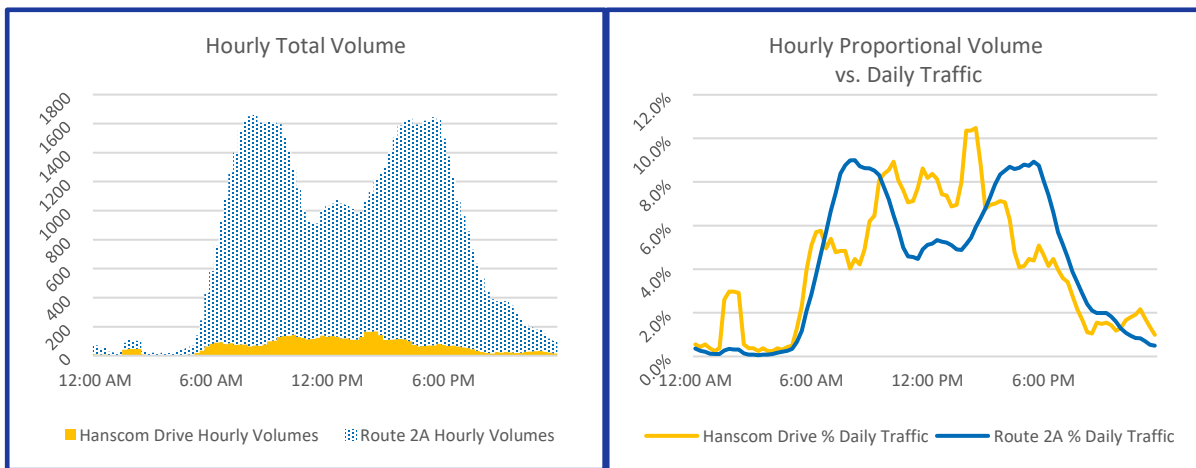
6.2.4 Hanscom Field Trip Characteristics

There are a variety of activities at Hanscom Field that generate automobile traffic and create ground transportation needs. These include general aviation, employment, student programs at the two flight schools that operate at Hanscom Field, and other business activities that support Hanscom Field operations. Employers include Massport, Rectrix, Linear Air, Jet Aviation, Signature Flight Support, East Coast Aero Club, Mike Goulian Aviation, and Boston Med Flight, among others. Trips to and from Hanscom AFB *are not included* in the ground transportation impacts of this ESPR. For the purposes of the 2017 ESPR analysis, Hanscom AFB activity includes any trips to and from any of the Hanscom AFB gates at Old Bedford Road, Airport Road, Hartwell Avenue, or Lincoln Labs.

Automatic Traffic Recorder (ATR) Observations

In April 2018, Automatic Traffic Recorder (ATRs) were used to conduct 24-hour traffic counts over a seven-day period on Hanscom Field roadways. Hanscom Field is an off-peak traffic generator, meaning that the peak traffic volumes for many Hanscom activities occur at a different time from the peak hours of the adjacent street traffic. That is, regional roadway traffic volumes generated by activities at Hanscom Field tend to occur outside of peak commuting hours. As shown in Figure 6-3, the peak hours of overall traffic volumes on Route 2A occur in the morning from 7:30 AM to 8:30 AM and in the evening from 4:30 PM to 5:30 PM. Hanscom Field, however, generates peak hour volumes outside of these hours. In general, Hanscom Field-related traffic is characterized by a small peak in traffic earlier in the morning (6:00 AM – 7:30 AM) before the start of the Route 2A morning commuter peak hour (generally 7:30 AM – 9:30 AM), followed by higher but steady traffic volumes at Hanscom Field observed throughout the middle of the day. Then traffic drops considerably before the afternoon peak hour on Route 2A begins (generally 4:00 PM).

Figure 6-3 Characteristics of Hanscom Field and Route 2A Vehicle Traffic Compared Based on ATB Location A and B (Total Hourly Volumes on the Left, Proportional Traffic vs. Total Daily Traffic on the Right)



Travel Survey Findings

As part of this ESPR update, Massport conducted a commute/travel survey. The purpose of this survey was to get a better understanding of how Hanscom Field employees and tenants are currently traveling to/from Hanscom Field and how they *would like* to travel to/from Hanscom Field in the future. This survey was conducted over a one-month period in May 2018; although this survey is used to support the 2017 ESPR update, survey data were collected in 2018 and, for consistency, will be labeled and referenced as such throughout this chapter.

Table 6-3 Mode of Choice to Hanscom Field

Mode	2005 ESPR Survey	2012 ESPR Survey	2017 ESPR Survey
Drive alone	87%	86%	90%
Dropped off	1%	0%	0%
Car pool	10%	0%	5%
Public Transportation	2%	12%	0%
Bicycle	0%	2%	0%
Other	0%	0%	5%
Total	100%	100%	100%

Source: 2012 ESPR, and FHI, 2018

In total, 62 survey responses were received: approximately 77 percent of respondents were tenants; 11 percent were Massport employees; and almost 12 percent indicated they were employees of MIT/Lincoln Labs, SATCS, or ECAC. Table 6-3 provides a comparison of survey results of similar surveys conducted for the 2005 and 2012 ESPRs as well as the 2018 survey. The 2018 results show that 90 percent of survey respondents drive alone to Hanscom Field while the remainder carpool. Overall, the results of the 2018 survey are consistent with previous ESPR surveys, showing that the majority of commuters traveling to the study area with personal vehicles. This high level of auto use is consistent with the general travel patterns in the area. Additional details on the results of the survey can be found in Appendix C.

Vehicle Occupancy Survey

Vehicle occupancy data were collected on Wednesday, April 4, 2018 to quantify the number of persons per vehicle entering and exiting Hanscom Field. While Massport recognizes that occupancy counts in 2018 are likely similar to 2017 conditions, these counts were conducted in 2018 and are therefore labeled and referenced as such throughout this chapter. More detailed information on these counts is provided in Appendix C.

The number of vehicles, as well as passengers per vehicle, entering and exiting Hanscom Field were counted from 6:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM to estimate an average Vehicle Occupancy Rate (VOR) for Hanscom Field; the VOR is calculated by dividing the total number of passengers by the number of vehicles entering and exiting Hanscom Field. It should be noted that MBTA bus ridership is not included in the VOR. Bicyclists and pedestrians are counted in the numerator of the calculation (total number of passengers); however, they are recorded as not having arrived in a vehicle. The results of the vehicle occupancy survey are presented in Table 6-4.

Table 6-4 Comparison of Vehicle Occupancy Rates

Morning/Afternoon	2018 Entering	2018 Exiting	2018 Overall	2012 ESPR
Morning Peak Hour	1.13	1.26	1.16	1.06
Afternoon Peak Hour	1.38	1.21	1.27	1.11
Source: 2012 ESPR, FHI, 2018				

As shown in Table 6-4, VOR for Hanscom Field have increased since 2012. The 2018 vehicle occupancy survey equates to 31 percent of people entering and exiting the site during the AM and PM peak hours doing so in a vehicle with one or more other passengers. This suggests that carpooling might occur with higher frequency than the 2017 ESPR travel survey indicates; however, it should be noted that the vehicle occupancy survey recorded *all* vehicles traveling to and from Hanscom Field, therefore freight and other business vehicles could skew results. The same methodology used in the 2012 ESPR was applied to the 2018 counts, which still suggests an increase in vehicle occupancy during that time.

Parking Survey

A parking demand survey was conducted from 11:00 AM to 1:00 PM on Thursday, April 12, 2018 (conditions in 2018 were substantially similar to those in 2017). As described in Chapter 2, vehicles were counted at the parking lots located at Hanscom Field. The parking demand survey assessed 984 of the 1,437 spaces currently available at Hanscom Field. Surveyors could not gain access to the parking facilities for Hangars 1, 2, and 3; the T-Hangars; and other secured facilities on the day of the survey. Instead, these spaces in these facilities were counted using aerial mapping (dated April 2017) and previous counts, including in the 2012 ESPR. These secured parking spaces account for an additional 453 parking spaces. Since the 2012 ESPR, there has been a reduction of 130 parking spaces at Hanscom Field, largely due to the construction of a new hangar on a portion of the Civil Air Terminal parking lot.

Of the 984 parking spaces surveyed, 467 were occupied on the day of the parking survey, which equates to an occupancy rate of approximately 47 percent. The largest parking lot at Hanscom Field – the 444-space public lot associated with the Civil Air Terminal Building – was approximately 46 percent occupied on the day of the survey. The recent relocation of the National Aviation Academy of New England to an off-airport location has significantly reduced student parking and associated vehicle trips.

6.2.5 Hanscom Field Peak Hour Trip Generation

The number of trips generated by Hanscom Field (which is distinct from Hanscom AFB traffic) during the peak hour is used to determine the impacts of Hanscom Field-related traffic on study area intersections. The peak hours for the analysis represent the time of day when traffic volumes along the adjacent roadways are highest. The morning and afternoon peak hour

vehicular trip generation for Hanscom Field is presented in Table 6-5 and indicates that the number of morning and afternoon peak hour vehicle trips to and from Hanscom Field in 2018 is less than the trips generated in the *2012 ESPR*. Between 2012 and the 2018 traffic counts, there has been an approximately 33 percent reduction in morning peak hour trips and a 12 percent reduction in afternoon peak hour trips. This is similar to the 21 percent reduction in daily traffic volumes seen at Hanscom Drive between 2012 and 2018 presented later in Figure 6-5. Trip generation at Hanscom Field furthermore exhibits directionality, with 67 percent of peak hour traffic entering Hanscom Field in the morning peak hour and 70 percent of peak hour traffic exiting Hanscom Field in the afternoon peak hour.

Table 6-5 also includes the *2012 ESPR* projections for the 2020 and 2030 forecast scenarios. Comparison of actual year 2018 traffic data with year 2020 projections from the *2012 ESPR* show that actual 2018 traffic volumes are considerably below the *2012 ESPR* projections for the morning and afternoon peak hours. This difference can be attributed to actual total aircraft operations at Hanscom Field in 2018 being almost 23 percent below the forecasts presented in the *2012 ESPR*. Specifically, declines in Training (SEP) operations (70,196 in 2012 to 46,014 in 2017) and the Personal Flying (SEP) operations (51,477 in 2012 to 33,040 in 2017), likely accounted for the reduction in peak hour vehicular trips to/from Hanscom Field. Additionally, the forecasted vehicle trips generated from the construction of a hotel and aeronautics museum included the 2020 forecast in the *2012 ESPR* have not been included in this analysis, since these facilities have not been constructed. Furthermore, the recent relocation of the National Aviation Academy of New England off-airport property has considerably reduced student parking and associated vehicle trips.

Table 6-5 Hanscom Field Peak Hour Trip Generation in Prior Years and 2018 Compared to 2012 Forecasts

Traffic Count Data	Morning Peak Hour			Afternoon Peak Hour		
	In	Out	Total	In	Out	Total
1996	61	33	94	43	70	113
2002	109	52	161	47	112	159
2005	115	42	157	75	79	154
2012	136	29	165	37	84	121
2018	74	36	110	32	75	107
2012 ESPR Scenarios						
2020 Forecast	178	42	220	46	120	166
2030 Forecast	291	99	390	122	223	345
Source: 2005 ESPR and 2012 ESPR						

2018 Traffic Count Results

Traffic counts were collected on roadways in the study area during a 7-day period from Thursday, April 5, 2018 through Wednesday, April 11, 2018 by ATRs. These counts provide detailed information on the current traffic patterns in certain areas surrounding Hanscom Field. The locations were based on previous ESPR's as well as coordination with Massport. The year 2018 ATR count locations are shown in Figure 6-4 and include:

- ⇒ Location A: Route 2A, east of Airport Road (Lexington);
- ⇒ Location B: Bedford Road, south of Route 2A (Lincoln);
- ⇒ Location C: Cambridge Turnpike Cutoff, southwest of Lexington Road (Lincoln, near Concord line);
- ⇒ Location D: Old Bedford Road, north of Virginia Road (Concord);
- ⇒ Location E: Route 62, west of Old Bedford Road (Concord); and
- ⇒ Location F: Hanscom Drive, north of Old Bedford Road (Lincoln).

In addition to these 7-day ATR counts, manual intersection/turning movement counts were conducted on Thursday, April 5, 2018 in the morning peak period between 6:00 AM and 9:00 AM and in the afternoon peak period between 3:00 PM and 6:00 PM. Manual counts were conducted at 10 intersections; these are shown on Figure 6-4, and include:

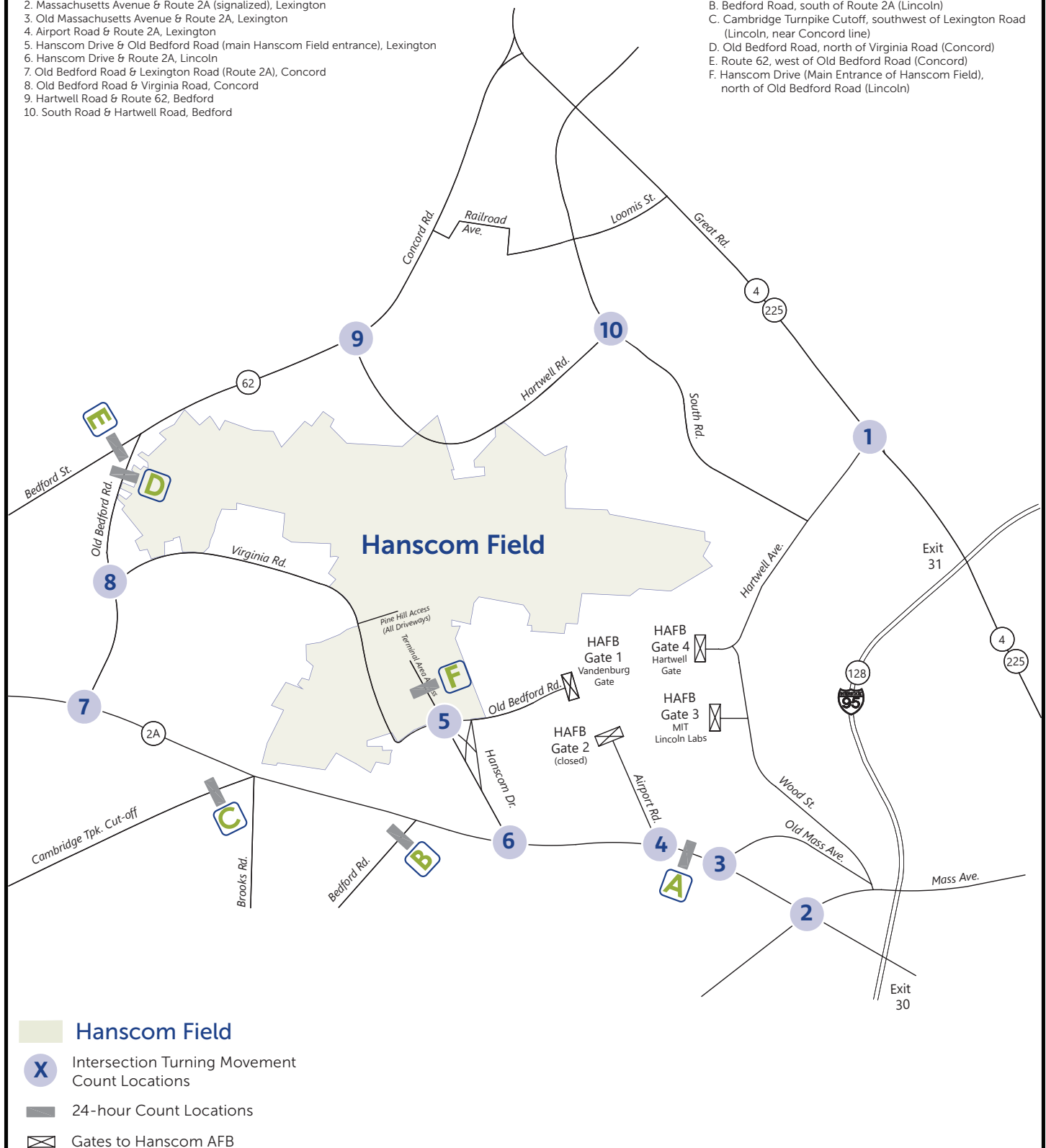
- ⇒ Location 1: Route 4/225 & Hartwell Avenue (signalized), Lexington;
- ⇒ Location 2: Massachusetts Avenue & Route 2A (signalized), Lexington;
- ⇒ Location 3: Old Massachusetts Avenue & Route 2A, Lexington;
- ⇒ Location 4: Airport Road & Route 2A, Lexington;
- ⇒ Location 5: Hanscom Drive & Old Bedford Road (main entrance), Lexington;
- ⇒ Location 6: Hanscom Drive & Route 2A, Lincoln;
- ⇒ Location 7: Old Bedford Road & Lexington Road (Route 2A), Concord;
- ⇒ Location 8: Old Bedford Road & Virginia Road, Concord;
- ⇒ Location 9: Hartwell Road & Route 62, Bedford; and
- ⇒ Location 10: South Road & Hartwell Road, Bedford.

Study Intersections:

1. Route 4/225 & Hartwell Avenue (signalized), Lexington
2. Massachusetts Avenue & Route 2A (signalized), Lexington
3. Old Massachusetts Avenue & Route 2A, Lexington
4. Airport Road & Route 2A, Lexington
5. Hanscom Drive & Old Bedford Road (main Hanscom Field entrance), Lexington
6. Hanscom Drive & Route 2A, Lincoln
7. Old Bedford Road & Lexington Road (Route 2A), Concord
8. Old Bedford Road & Virginia Road, Concord
9. Hartwell Road & Route 62, Bedford
10. South Road & Hartwell Road, Bedford

Daily Count Locations:

- A. Route 2A, east of Airport Road (Lexington)
- B. Bedford Road, south of Route 2A (Lincoln)
- C. Cambridge Turnpike Cutoff, southwest of Lexington Road (Lincoln, near Concord line)
- D. Old Bedford Road, north of Virginia Road (Concord)
- E. Route 62, west of Old Bedford Road (Concord)
- F. Hanscom Drive (Main Entrance of Hanscom Field), north of Old Bedford Road (Lincoln)



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**Traffic Study Area
Count Locations**

Figure 6-4

Traffic Volume Adjustments

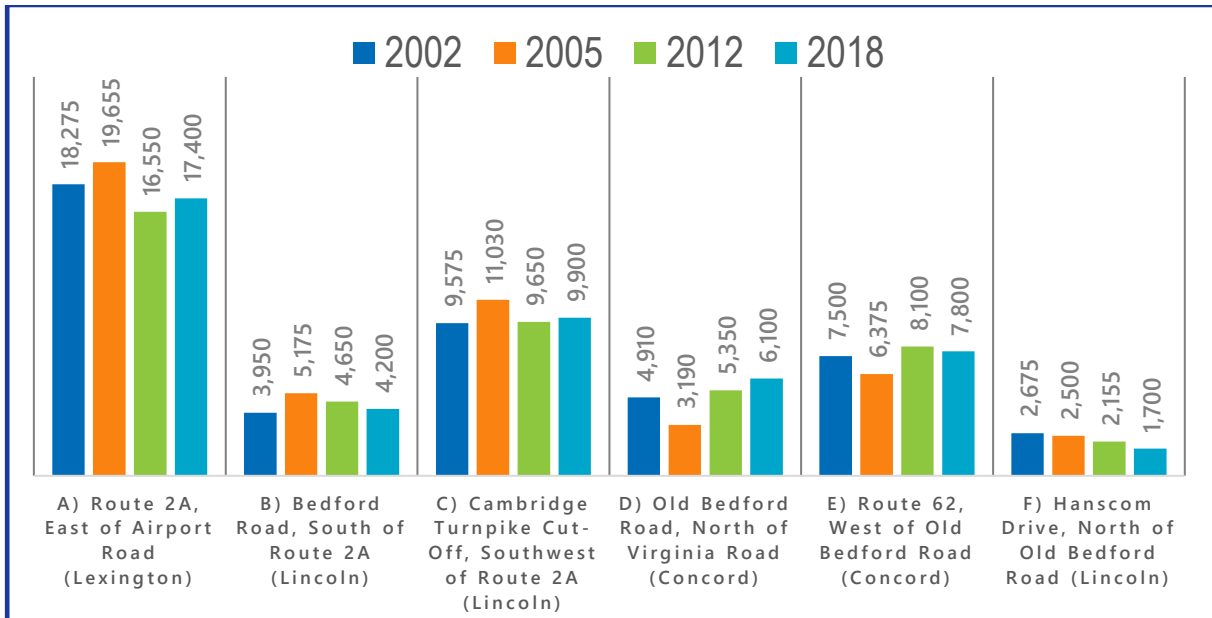
Development of the 2018 AM and PM peak hour traffic networks required the adjustment of the manual intersection and ATR counts from April 2018 to account for the seasonal variation in traffic volumes. Based on *Massachusetts Department of Transportation (MassDOT) Traffic Impact Assessment (TIA) Guidelines*, analysis of the nearby Continuous Count Stations was reviewed for 2017 (the most recent calendar year available). Station H8509 on I-95 at the Route 2A interchange was found to have an average day of traffic in April of 96.5 percent of the yearly average. Thus, based on data from this counter, all traffic figures in this document incorporate a baseline upward adjustment of 3.6 percent to account for the seasonal variation in traffic. An original report from Continuous Count Station H8509 is provided in Appendix C.

Additionally, adjustments were made to the Hanscom Field turning count movements at the Hanscom Drive / Old Bedford Road intersection based on the ATR placed on Hanscom Drive. Review of weekly peak hour data revealed that the volumes counted during the morning and afternoon on the day of the manual turning movement counts were approximately 12 to 19 percent below the weekday average (Tu/W/Th only). Therefore, to accurately demonstrate the trip distribution of Hanscom Field, traffic volumes to and from Hanscom Field were increased by the appropriate percentages to represent a typical daily average. Further detail of this process is shown in Appendix C.

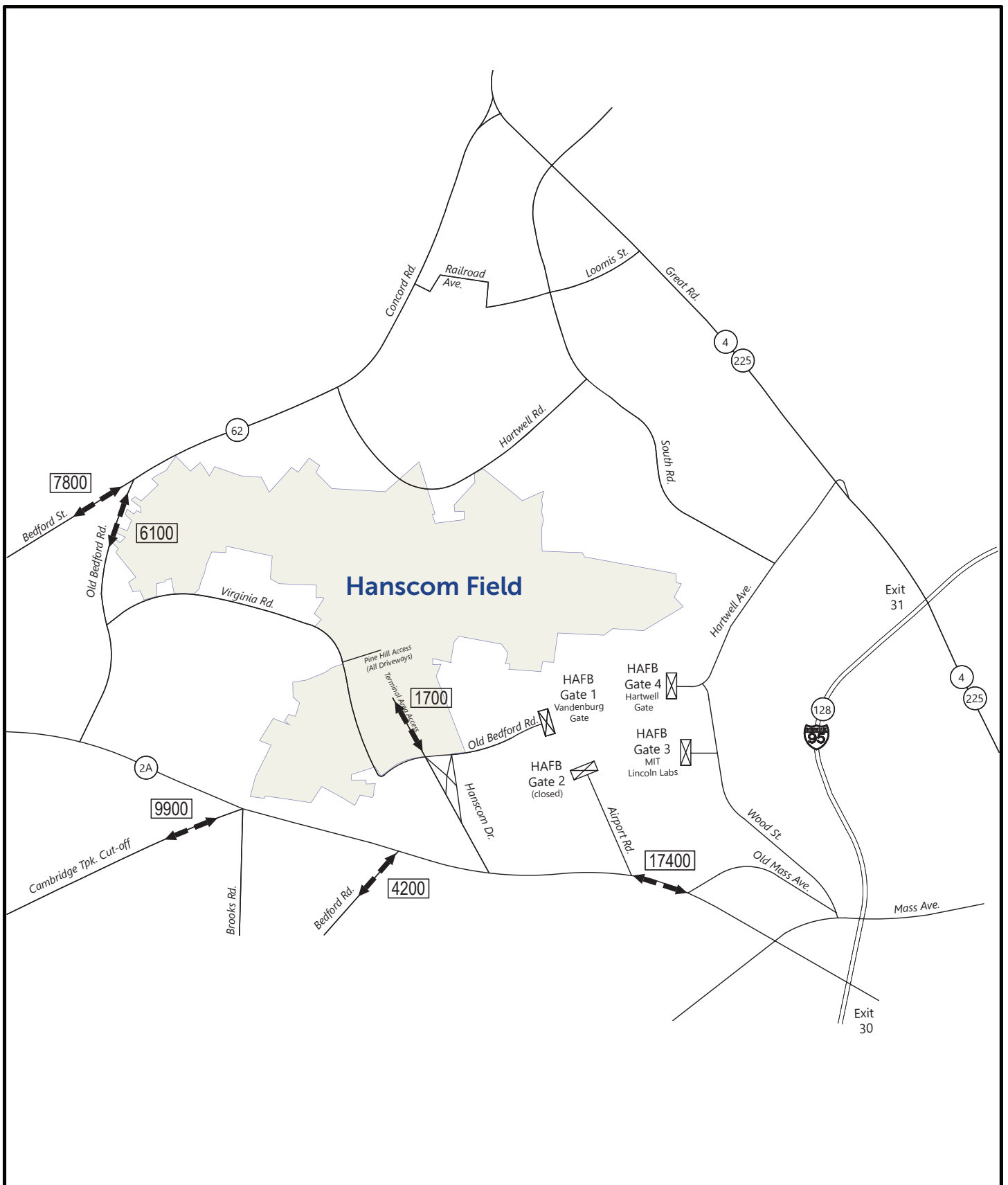
Historic Traffic Trends

Figure 6-5 presents a comparison of average weekday traffic volumes from 2002 to 2018; Year 2018 average weekday traffic volumes are also shown on Figure 6-6. In 2018, average weekday traffic volumes on Hanscom Drive are approximately 1,700 vehicles per day (vpd), which is 21 percent less than the 2012 volumes at this same location. This decrease is likely attributable to the reduced private aircraft operations at Hanscom Field between 2012 and 2017 and the relocation of the aviation school from Hanscom Field. Route 2A, Cambridge Turnpike Cut-off, and Old Bedford Road all experienced increases in average weekday traffic volumes between 2012 and 2018, while Bedford Road and Route 62 both experienced decreases in average weekday traffic volumes.

Figure 6-5 Comparison of 2002, 2005, 2012, and 2018 Average Weekday Traffic Volumes



Source: 2005 *ESPR* and 2012 *ESPR* for historical data, FHI, 2018 for 2018 data.



North
↑ NOT TO SCALE



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2018 Average Weekday
Traffic Volumes

Figure 6-6

6.2.6 Capacity Analysis

Detailed analyses of peak hour intersection operations and traffic conditions were conducted for the 10 intersections shown in Figure 6-4.

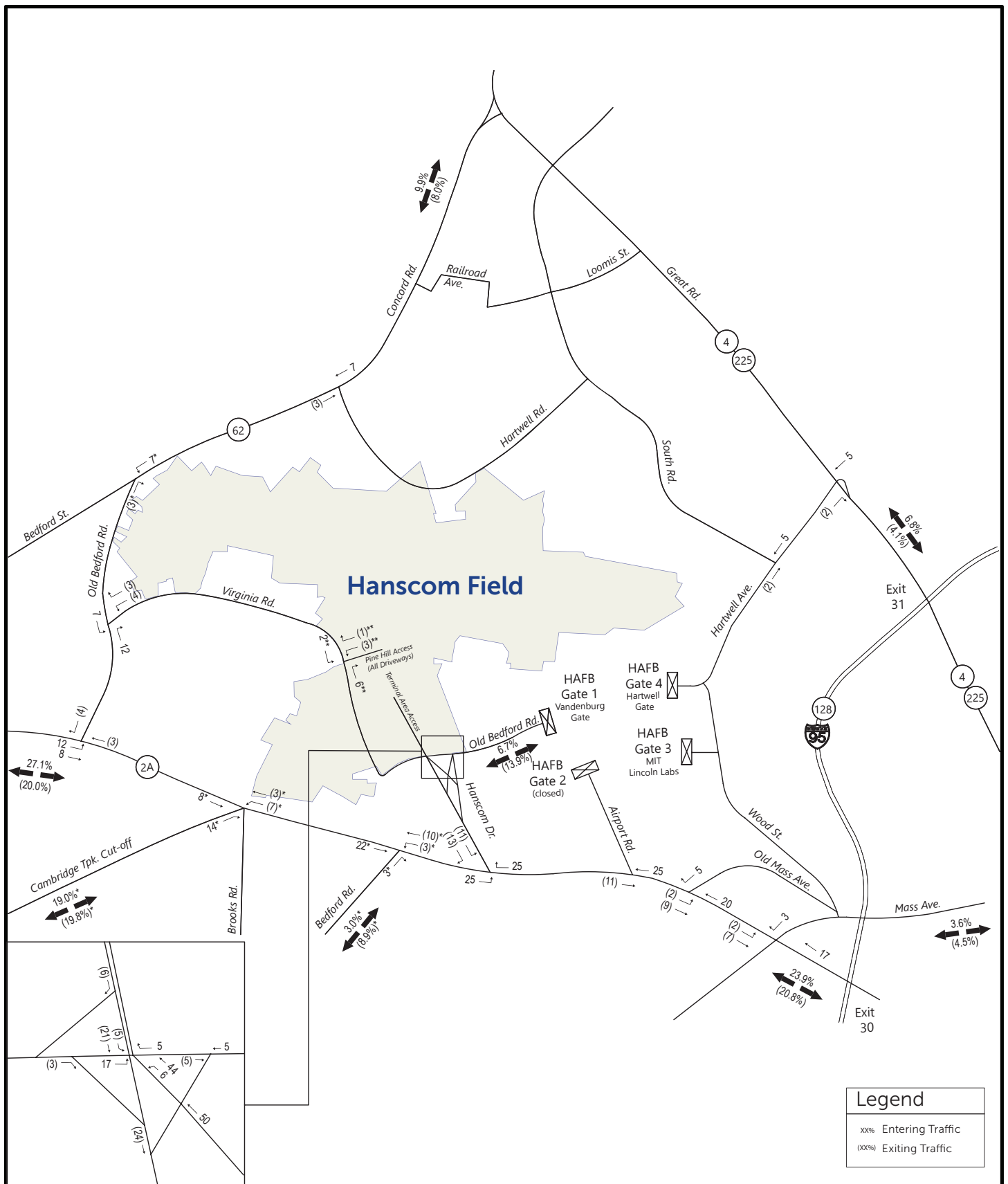
Peak Hour Networks

Figure 6-7 and Figure 6-8 present the morning and afternoon peak hour volumes for the intersections studied in April of 2018. In the morning, most of the traffic on Route 2A travels eastbound to Route 128/I-95. In the afternoon, most traffic on Route 2A travels westbound from Route 128/I-95. These trends primarily reflect commuting patterns between the surrounding towns and regional employment centers along and within the Route 128/I-95 corridor and the Boston Metro area to the east. Along Route 4/225, traffic counts show that morning commuters are destined to Route 128/I-95 but also to the Hartwell Avenue area. This is because Hartwell Avenue serves as a hub of employment and also serves as one of several access points to Hanscom AFB.

Hanscom Field Trip Distribution

Figure 6-9 and 6-10 present the 2018 peak hour trip distribution and traffic volumes during the April 2018 study period for Hanscom Field-related traffic for morning and afternoon peak hours, respectively. The existing trip distribution of Hanscom Field traffic was determined based on Hanscom main entrance directional peak hour traffic volumes and modeling of the distribution of peak hour traffic volumes at intersections within the study area.

The opening of Rectrix since 2012 has added aviation-based traffic along Virginia Road. For the purposes of this capacity analysis, the driveways serving the Pine Hill area of Hanscom Field (Rectrix Aviation Hangar and the Pine Hill T-Hangars) were assumed to be located at one access point, as illustrated in Figure 6-9 and Figure 6-10. Furthermore, while dedicated turning movement counts were not conducted at Rectrix, trips to/from this facility were estimated in proportion to the parking survey conducted on April 12, 2018. Trip distribution was assigned to match the trip distribution observed at the main Hanscom Drive access. The trip estimation and distribution estimation procedures are provided in Appendix C.



North
↑
NOT TO SCALE



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2018 Morning Peak Hour Trip Distribution (Hanscom Field Only)

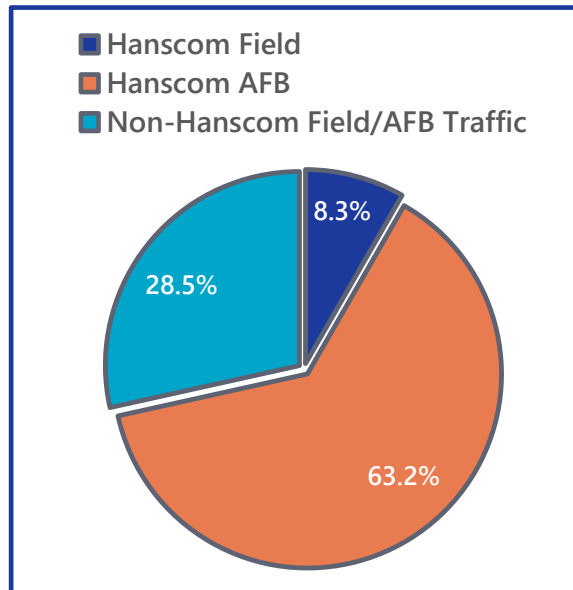
Note: * Designates estimated distribution based on 2012 ESPR and 2018 observed counts at adjacent locations.
 ** Designates trip generation and turn counts based on estimates by FHJ

Figure 6-9

Hanscom Drive Traffic Volumes

Figure 6-11 and Figure 6-12 illustrate the different traffic contributors on Hanscom Drive in 2018 during the morning and afternoon peak hours using data from the turning movement counts. In 2018, Hanscom Field-related traffic accounts for 8.3 percent of volumes during the morning peak hour and 8.9 percent of volumes during the afternoon, as compared to 14 percent in the morning peak and 13 percent in the afternoon peak hours in 2012. The reduction in Hanscom Field-related volumes reflects a decrease in traffic traveling to and from Hanscom Field for the reasons previously discussed in this chapter. Hanscom AFB traffic continues to grow as the largest component of Hanscom Drive traffic. In 2018, Hanscom AFB accounted for 63 percent of traffic in the morning peak hour and 60 percent of traffic in the afternoon peak hour, as compared to 59 percent and 62 percent, respectively in 2012.

Figure 6-11 2018 Morning Peak Hour Traffic on Hanscom Drive



Intersection Screening Process

The Massachusetts Environmental Policy Act (MEPA) has established a threshold for identifying intersections with significant impacts related to Hanscom Field. Hanscom Field traffic is considered to impact an intersection if one or more of the intersection's individual peak hour traffic movement(s) consists of 10 or more percent Hanscom Field-related traffic. The traffic volumes at each of the 10 study intersections were assessed to determine which intersections had individual turning movements that met or exceeded the 10 percent MEPA threshold. Table 6-6 lists the four intersections that have exceeded the 10 percent threshold for the 1996 through 2018 analysis years. Intersection operations were calculated for year 2018 conditions for intersections that exceeded the threshold.

Figure 6-12 2018 Afternoon Peak Hour Traffic on Hanscom Drive

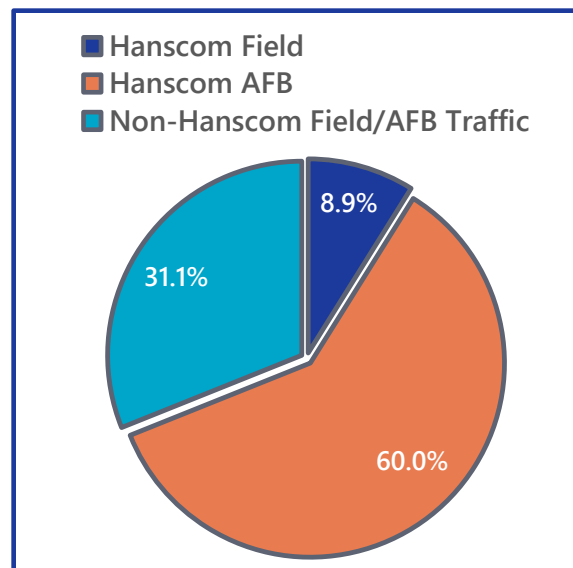


Table 6-6 Intersections Exceeding Ten-Percent Threshold: 1996-2018

Intersection	Peak Hour	Analysis Years				
		1996	2002	2005	2012	2018
#5 Hanscom Drive/Old Bedford Road (Lincoln)	Morning	X	X	X	X	X
	Afternoon	X	X	X	X	X
#6 Hanscom Drive/Route 2A (Lincoln)	Morning	X	X	X	X	X
	Afternoon		X	X	X	X
#10 Old Bedford Road/Virginia Road (Concord)	Morning	X	X	X		X
	Afternoon	X	X	X	X	X
#11 Old Bedford Road/Route 62 (Concord)	Morning					
	Afternoon			X		

Note: "X" denotes intersection with turning movement exceeding 10 percent MEPA threshold.
Source: 2000, 2005 and 2012 Hanscom Field ESR and FHI, 2018

Analysis of Intersection Operations

This section provides the results of the intersection operation analysis in terms of overall intersection level of service (LOS), volume-to-capacity (v/c) ratios, and intersection delay (in seconds) for the screened intersections. LOS calculation sheets are provided in Appendix C. The performance of the study intersections was analyzed using the traffic modeling software program Synchro 10 and measured using LOS, which is a generally accepted measure of the quality of service determined based on the process specified in the 6th Edition of the Transportation Research Board *Highway Capacity Manual* (HCM).⁸⁹ Intersection LOS ranges from 'A' to 'F' where LOS 'A' represents optimal conditions with fewer than 10 seconds of delay, while LOS 'F' represents failing conditions where delay exceeds 50 seconds at unsignalized intersections or 80 seconds at signalized intersections. Table 6-7 shows the delay thresholds for LOS at signalized and unsignalized intersections.

⁸⁹ Transportation Research Board, *Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis*. National Academies of Sciences, Engineering and Medicine. 2016.

Table 6-7 Intersection Level-of-Service (LOS) Criteria (HCM, 6th Edition)

LOS	Average delay per vehicle (seconds)	
	Signalized intersections	Unsignalized intersections
A	<10.0	<10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	>80.0	>50.0

Source: FHI, 2018

Tables 6-8 and 6-9 summarize the 2018 peak hour traffic operations for the intersections where Hanscom Field traffic represented more than 10 percent of all traffic movement. Detailed traffic capacity analysis reports are included in Appendix C. Interpretation of Tables 6-8 and 6-9 for the Hanscom Drive/Old Bedford Road intersection requires an understanding of how this single intersection is modeled using Synchro. While the main intersection functions as a two-way, stop-controlled intersection, with Hanscom Drive given priority, the entire intersection is, in fact, controlled by three other separately modeled intersections (see Figure 6-13 for a diagram of the Hanscom Drive/ Old Bedford Road intersection).

Figure 6-13 Diagram of Sub-Intersections Analyzed at the Hanscom Drive and Old Bedford Road Intersection

This includes: (1) the stop-controlled intersection between northbound traffic on Hanscom Drive and southbound traffic from Hanscom AFB (intersection #51); (2) the stop-controlled intersection between eastbound traffic on Old Bedford Road and southbound traffic from Hanscom AFB (intersection #52); and (3) the yielding action that northbound vehicles headed to Hanscom AFB must make to vehicles continuing eastbound on Old Bedford Road (intersection #53). It should be noted that the delay to vehicles would thus be a compound delay by multiple movements and should be considered in any future intersection configuration.

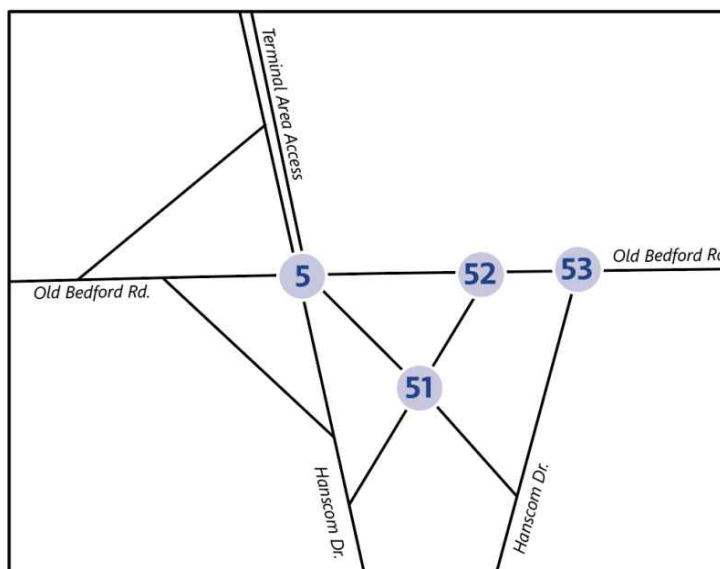


Table 6-8 Morning Peak Hour Operations at Screened Intersections

Intersection	Weekday morning peak hour		
	LOS	Delay [s]	v/c
#5 Hanscom Drive/Old Bedford Road			
Hanscom Drive NB (L)	A	7.5	0.10
Hanscom Drive SB (L)	A	7.3	0.01
Old Bedford Road EB (L T)	C	16.8	0.34
Old Bedford Road WB (T)	B	13.1	0.03
#51 Hanscom Drive/Old Bedford Road WB L Ramp			
Hanscom Drive NB (T)	B	11.7	0.28
#52 Hanscom Drive/Old Bedford Road WB L Turn			
Old Bedford Road EB (T)	B	10.7	0.17
#53 Hanscom Drive NB R Ramp/Old Bedford Road			
Hanscom Drive NB (R)	B	14.6	0.59
#6 Hanscom Drive/Route 2A			
Hanscom Drive SB (L)	F	>300.0	3.68
Hanscom Drive SB (R)	B	13.4	0.29
Route 2A EB (L)	A	9.8	0.32
#8 Old Bedford Road/Virginia Road			
Virginia Road WB (L R)	C	21.6	0.36
Old Bedford Road SB (L)	A	8.7	0.13
Note: "L" denotes left-turn, "T" denotes thru-traffic, "R" denotes right-turn Source: FHI, 2018			

Table 6-9 Afternoon Peak Hour Operations at Screened Intersections

Intersection	Weekday afternoon peak hour		
	LOS	Delay [s]	v/c
#5 Hanscom Drive/Old Bedford Road			
Hanscom Drive NB (L)	A	7.5	0.08
Hanscom Drive SB (L)	A	7.3	0.01
Old Bedford Road EB (L T)	C	15.0	0.05
Old Bedford Road WB (T)	B	13.8	0.23
#51 Hanscom Drive/Old Bedford Road WB L Ramp			
Hanscom Drive NB (T)	B	14.7	0.27

Intersection	Weekday afternoon peak hour		
	LOS	Delay [s]	v/c
#52 Hanscom Drive/Old Bedford Road WB L Turn			
Old Bedford Road EB (T)	B	12.4	0.02
#53 Hanscom Drive NB R Ramp/Old Bedford Road			
Hanscom Drive NB (R)	A	8.7	0.09
#6 Hanscom Drive/Route 2A			
Hanscom Drive SB (L)	F	>300.0	3.00
Hanscom Drive SB (R)	F	228.3	1.38
Route 2A EB (L)	B	11.5	0.14
#8 Old Bedford Road/Virginia Road			
Virginia Road WB (L R)	F	92.8	1.08
Old Bedford Road SB (L)	A	8.9	0.04
Note: "L" denotes left-turn, "T" denotes thru-traffic, and "R" denotes right-turn Source: FHI, 2018			

At the intersection of Hanscom Drive and Route 2A, the analysis indicates that southbound Hanscom Drive experiences significant delays during both the morning and afternoon peak hours. However, it appears that the analysis is not accurately representing actual operating conditions. Based on field observations, several unique behaviors are occurring at this intersection requiring additional interpretation:

- ⇒ Motorists offer other motorists "courtesy gaps". For example, motorists on Route 2A were observed stopping to allow motorists to turn left from Hanscom Drive onto Route 2A. Additionally, motorists on westbound Route 2A were observed stopping to allow other motorists on Route 2A to turn left onto to Hanscom Drive.
- ⇒ Motorists in both the left-turn lane and the right-turn lane on Hanscom Drive were seen doing "rolling stops", or not stopping fully before traveling through the intersection.
- ⇒ Due to the longer wait times experienced by left-turning vehicles on Hanscom Drive, several vehicles were observed making "risky" turns, or turning during a gap between vehicles that is smaller than what is typically considered safe.

Thus, real-world conditions differ from modeled conditions, which are based on vehicles following standard driving rules. Therefore, non-standard behaviors, such as drivers on Route 2A giving "courtesy gaps" to the minor movement, drivers not making a full and complete stops, and drivers making "risky" turns in small gaps, mean that modeled conditions can be substantially different than observed conditions. These factors result in Synchro over estimating the delay and queues at this intersection. However, while these observed behaviors may improve the capacity of the intersection, the large delay at this intersection can encourage

drivers to make riskier maneuvers than they otherwise might, increasing risks of collision and causing a safety hazard for all users of the intersection.

6.2.7 Safety Analysis

The crash history of the three screened intersections was evaluated to identify safety deficiencies and determine if any location experiences a higher than average annual crash rate. The safety data is summarized in Table 6-10.

Table 6-10 Intersection Crash Summary: 2012 - 2016

Traffic Control	#5) Hanscom Drive / Old Bedford Road (Lincoln)	#6) Hanscom Drive / Route 2A (Lincoln)	#8) Old Bedford Road / Virginia Road (Concord)
	Unsignalized	Unsignalized	Unsignalized
Year			
2012	0	2	0
2013	0	2	0
2014	2	1	0
2015	0	6	1
2016	1	2	0
Total	3	13	1
Type			
Angle	2	8	0
Rear-End	0	3	0
Head-on	1	0	0
Sideswipe	0	1	1
Single Vehicle	0	1	0
Total	3	13	1
Severity			
Property Damage Only	2	11	1
Personal Injury	1	1	0
Fatality	0	0	0
Other	0	1	0
Total	3	13	1
Weather			
Clear	1	10	0
Cloudy	0	1	1

Traffic Control	#5) Hanscom Drive / Old Bedford Road (Lincoln)	#6) Hanscom Drive / Route 2A (Lincoln)	#8) Old Bedford Road / Virginia Road (Concord)
	Unsignalized	Unsignalized	Unsignalized
Rain	0	0	0
Snow	1	2	0
Unknown/Other	1	0	0
Total	3	13	1
Time			
7:00 AM to 9:00 AM	1	1	1
9:00 AM to 4:00 PM	1	4	0
4:00 PM to 6:00 PM	0	4	0
6:00 PM to 7:00 AM	1	4	0
Total	3	13	1
Rates			
State Wide Rate	0.57		
District Wide Rate	0.57		
Intersection Rate	0.14	0.30	0.08
Source: FHI, 2018			

Seventeen crashes were reported at the three screened intersections from 2012 to 2016. The majority of crashes involved property damage only; no fatalities were reported. Angled crashes, rear-end crashes and single-vehicle crashes, combined, comprised approximately 82 percent of the crashes at the intersections. The 13 crashes that occurred at Hanscom Drive/Route 2A (Lincoln) ranked highest among the three screened intersections, with an average of 2.6 crashes per year; this is lower than the 3.4 crashes per year reported in the 2012 *ESPR*. Additionally, the crash rate at this intersection is lower than the statewide and district-wide averages (0.57 crashes per year) for unsignalized intersections. The MassDOT Crash Rate Worksheets for the three screened intersections are provided in Appendix C.

6.2.8 Multi-Modal Assessment

Single Occupancy Vehicle (SOV) trips are more frequently associated with higher transportation impacts than alternative modes of travel. Transit, carpooling, bicycling, and walking have the potential to reduce Hanscom Field-related vehicle trips and traffic impacts on area roadways. Thus, it is important to document existing conditions to understand recommendations for the future.

2018 Pedestrian and Bicycle Count Results

Tables 6-11 and 6-12 present the bicycle and pedestrian counts collected at the studied intersections. Manual traffic counts collected in April 2018 for this project also included counts of bicycles and pedestrians at all 10 count locations. The ATR counts recorded bicycle movements.

It is important to note that pedestrian and bicycle counts are sensitive to seasonal temperature patterns as well as daily weather. Weather conditions at Hanscom Field on April 5th were reported to be between 28°F and 43°F with partly cloudy skies and no participation. While seasonal variation between peak summer conditions and winter season likely exists in this area, no equivalent to a seasonal adjustment factor is available for these counts; however, these modes are not a significant component of Hanscom Field ground access activity.

Table 6-11 Total Cyclists and Pedestrians Counted in AM and PM Peak Hours on Thursday, April 5, 2018

Location	Cyclists Counted		Pedestrians Counted	
	AM Total	PM Total	AM Total	PM Total
Bedford Street & Hartwell Avenue	1	1	13	4
Mass Avenue and Route 2A	4	2	0	1
Old Mass Avenue and Route 2A	4	2	0	0
Airport Road and Route 2A	4	3	0	0
Hanscom Drive and Old Bedford Road	4	10	1	0
Hanscom Drive and Route 2A	4	6	0	0
Old Bedford Road and Lexington Road	6	9	0	0
Old Bedford Road and Virginia Road	6	15	5	8
Concord Road and Hartwell Road	3	4	1	0
South Road and Hartwell Road	5	3	1	0
Note: AM peak hour is 6:00 AM to 9:00 AM; PM peak hour is 3:00 PM to 6:00 PM Source: FHI 2018				

Table 6-12 Total Cyclists Counted During the Day of Thursday, April 5, 2018

Location	Cyclists Counted
Route 2A east of Airport Road (Bidirectional)	47
Bedford Road South of Route 2A	5
Cambridge Turnpike Cutoff South of Lexington Road	20
Old Bedford Road north of Virginia Road	20
Route 62 west of Old Bedford Road	18
Hanscom Drive north of Old Bedford Road	8
Source: FHI, 2018	

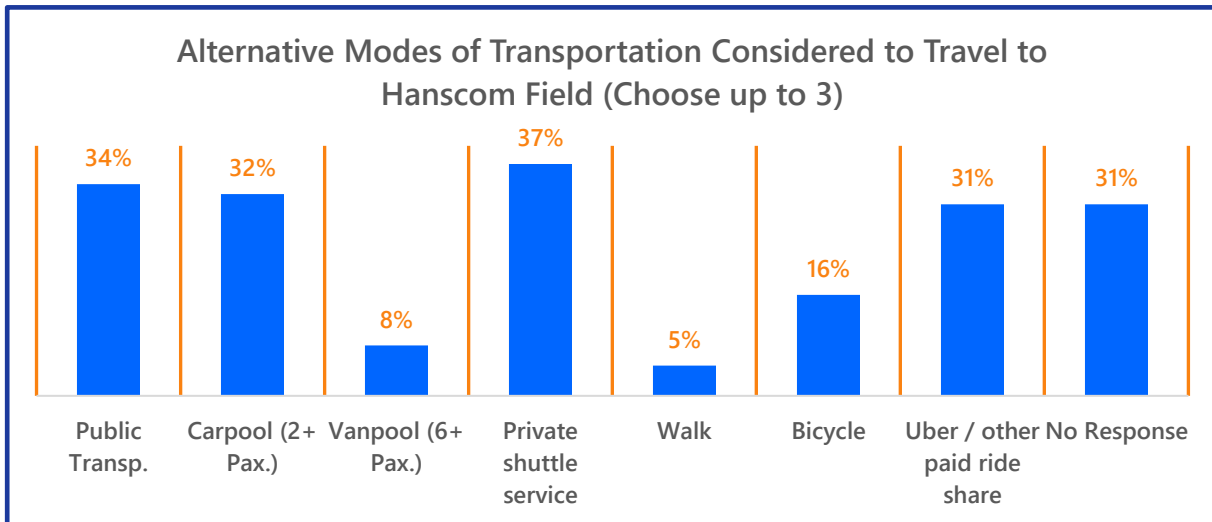
Travel Survey Findings

An online commute/travel survey was administered to Hanscom Field employees and tenants in May 2018 to identify and understand current travel patterns and opportunities to reduce SOV trips to and from Hanscom field. In total, 62 survey responses were collected in 2018, which is comparable to the number of responses (65) collected in 2012. The results of the travel survey can be found in Appendix C.

Survey respondents were asked questions on their travel habits and specific actions that could be taken which may make commuting via an alternative mode of transportation more viable. Overall, 90 percent of survey respondents stated they drive to Hanscom Field alone, while five percent indicated that they carpool with other Hanscom employees. These results confirm past findings which show that the majority of commuters to Hanscom Field do so by SOV.

Many respondents showed moderate interest in exploring alternative modes of transportation to get to, from, and around the Hanscom Field area as shown in Figure 6-14. These findings demonstrate that while SOV trips remain the dominant means of transportation to and from Hanscom Field, further exploration into other modes of transportation is valuable.

Figure 6-14 Travel Survey Results Showing Interest in Alternative Travel to Hanscom Field



Source: FHI, 2018

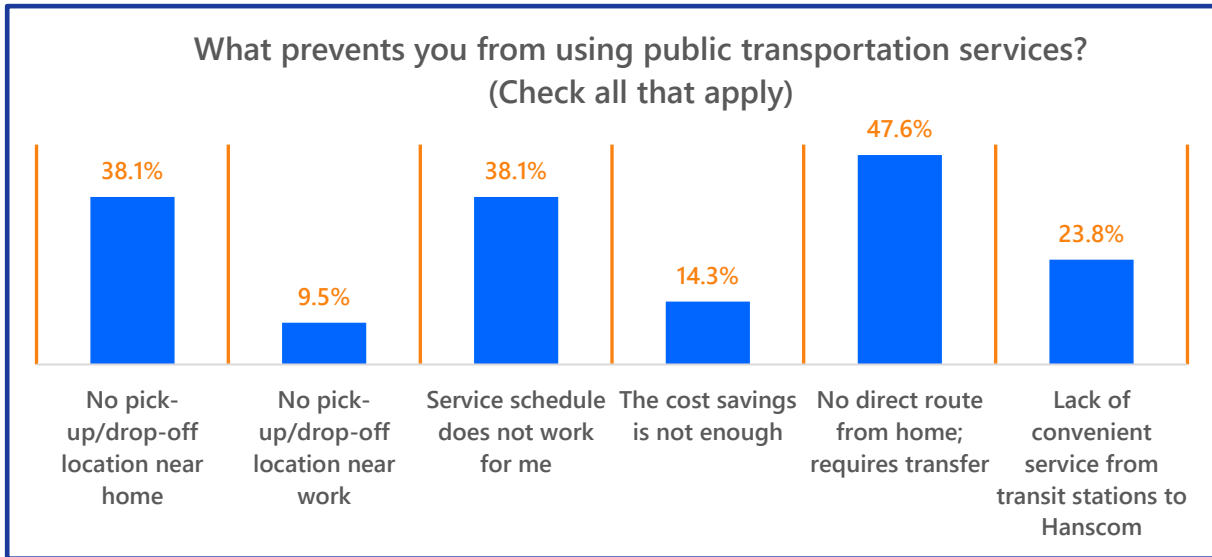
In particular, interest in exploring transit, private shuttle service, and promoting carpooling were identified by survey respondents. This is likely since nearly all respondents (98 percent) of respondents live more than a mile away, and most respondents (74 percent) live more than 10 miles away. This means that walking and bicycling trips to and from Hanscom Field are not a reasonable option for many commuters to and from Hanscom Field.

Public Transportation and Shuttle Services

Figure 6-14 illustrates that twenty-one respondents (34 percent) responded that they would consider taking public transportation as an alternative mode of transportation, however survey respondents identified significant barriers in current public transportation access to Hanscom Field. This includes the lack of direct routes from home, no pick-up/drop-off location near home, and a transit schedule which is perceived as inconvenient. One survey respondent indicated that faster service between either the MBTA Red Line at Alewife station, or the MBTA commuter rail in Lincoln or Concord would be necessary before that person would take public transportation.

Notably, and as illustrated in Figure 6-15, nine of the 21 respondents (41 percent) who responded that they would consider taking public transportation as an alternative mode of transportation (34 percent of total survey respondents) stated they would consider taking public transportation if there was more convenient bus services and/or more frequent private shuttles between the Alewife Station on the MBTA red line or Concord Station or Lincoln Station on the MBTA commuter rail.

Figure 6-15 Travel Survey Results Showing Factors Constraining Use of Public Transportation of Those Indicating Interest in Using Public Transportation



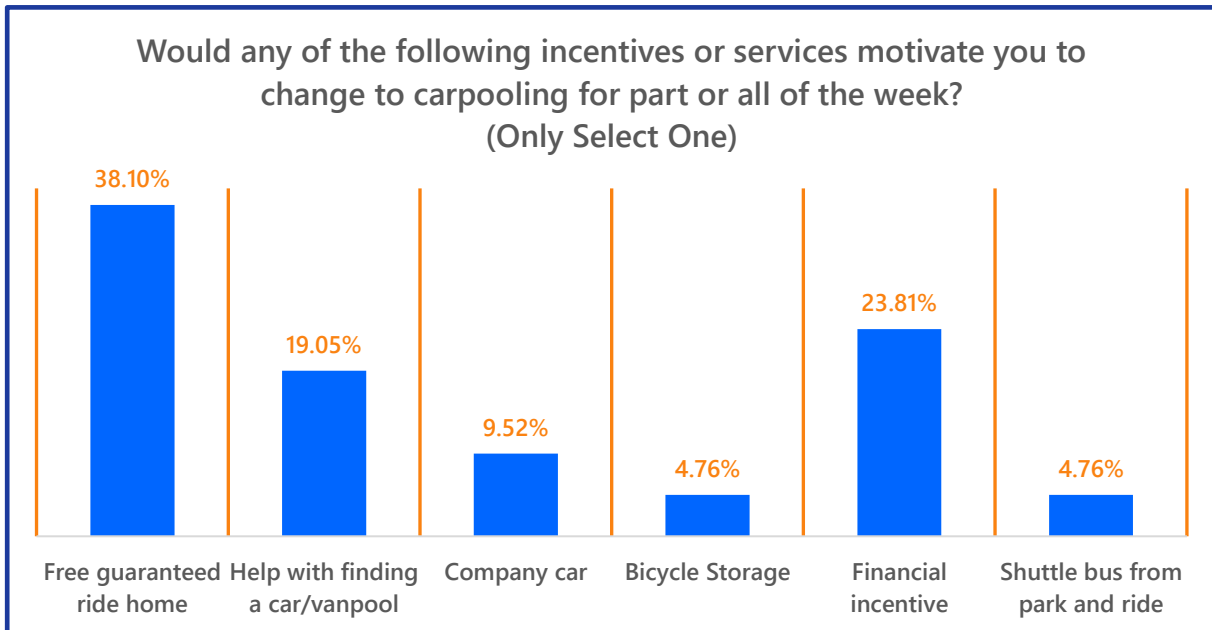
Source: FHI, 2018

Car/Vanpooling

Of all respondents of the travel survey, five percent indicated they carpool on most days, while an additional three percent indicated they sometimes carpool as secondary means to get to Hanscom Field. Furthermore, many respondents were receptive to the prospect of carpooling with other Hanscom employees, with 49 percent of employees indicating interest. However, analysis of the respondent data shows that carpooling may be difficult to implement. For example, only 37 percent of respondents indicated they travel to Hanscom Field five or more days a week, and analysis of respondent zip code data shows a wide geographic spread of commuters to Hanscom Field. Both these factors make finding adequate carpooling matches difficult.

As illustrated in Figure 6-16, of the 21 respondents who indicated interested in carpooling and responded to a question posed soliciting responses on incentives which would motivate respondents to do so, eight respondents (38 percent) indicated that a free guaranteed ride home program would be most likely to promote a switch to carpooling, followed by financial incentives at 24 percent, and help finding a car/vanpool at 19 percent.

Figure 6-16 Travel Survey Results Showing Factors Which Would Encourage Carpooling of Those Indicating Interest in Carpooling or Vanpooling



Source: FHI, 2018

Active Transportation

In general, the commute/travel survey highlights the wide geography of commuters to the study area. Notably, less than 2 percent of survey respondents indicated they live less than one mile away from Hanscom Field, while 24 percent live between 1 and 10 miles from Hanscom Field. Therefore walking cannot be considered a viable means of commuting for survey respondents.

However, bicycling could be an option for commuters to Hanscom Field. While no respondents indicated that cycling was a primary means of travel to the study area, 11 percent indicated that they sometimes walk or bicycle to Hanscom Field and 23 percent of respondents indicated some level of interest in bicycling as an alternative to their primary means of travel. The travel survey further shows that a sizable percentage (26 percent) of commuters live 10 miles or less to Hanscom Field, making cycling a reasonable alternative for this population.

Even with a sizable percentage of respondents indicating some level of interest in bicycling to Hanscom Field, 70 percent of respondents indicated that bicycle facilities are not adequate to make biking a viable option. This includes street infrastructure – as many respondents feel there is no safe route for them to bike – and on-site amenities not currently provided to cyclists such as showers and covered bike storage.

In particular, respondents noted several locations on and near the study area in need of pedestrian and bicycling improvements. These include: (1) Hanscom Drive between the Civil Air Terminal to Route 2A, (2) the intersection of Hanscom Drive and Old Bedford Road, (3)

Virginia Road to the north of Old Bedford Drive, and (4) Route 2A connecting Hanscom Drive to Lexington to the east.

MBTA Bus Ridership Data

MassDOT releases MBTA bus ridership data by bus stop on an annual basis. As of the release of this report, the most recent data available was for the year 2016.

As described in earlier in this chapter, Hanscom Field is served by MBTA Route 76 on weekdays and a combined Route 62/76 on Saturdays; service is not provided on Sundays. Route 76 service is provided approximately every half-hour during peak hours and hourly during mid-day hours. Saturday service is provided hourly. Average weekday ridership at the Civil Air Terminal averages roughly 8 boardings and alightings per day while ridership at the intersection of Hanscom Road and Old Bedford Road on weekdays averages about 17 boardings and alightings per day.

Route 76 provides local service between Alewife Station via Lincoln Lab and Lexington Center. However, this route requires a stop-over at the Lincoln Labs stop before connecting to the Civil Air Terminal at Hanscom Field. Additionally, the Route 76 bus route between Alewife and Hanscom Field utilizes local roadways instead of traveling on Route 2. The design of this route with the stop-over at Lincoln Labs and the design of this route utilizing only local roadways reduces the time-competitiveness of transit when compared to driving a private automobile.

128 Business Council Shuttle Service

The 128 Business Council operates The Rev Bus-Hartwell Area Shuttle, which is a commuter shuttle service that operates each rush hour between the MBTA Red Line Alewife Station in Cambridge and worksites along Hartwell Avenue. The REV Bus is partially funded by major property developers in the Hartwell Avenue corridor of Lexington and Bedford, and partially funded by the Towns of Lexington and Bedford. In the AM peak hour, shuttles depart Alewife Station at 6:30 AM, 7:30 AM and 9:00 AM arriving at 131 Hartwell Avenue (near the Hartwell Gate to the Hanscom AFB) within 15 to 25 minutes; in the PM peak hour shuttles depart 131 Hartwell Avenue at 4:26 PM, 5:51 PM, and 7:21 PM, arriving at Alewife Station about 35 minutes later.

6.3 Future Analysis Conditions

This section describes the background assumptions and methodology used to evaluate future roadway and traffic volume conditions within the study area for the 2025 and 2035 scenarios. The 2017 *ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3 Airport Activity Levels. The 2025 and 2035 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes.

Future increases in weekday, peak hour traffic volumes were estimated for the 2025 and 2035 scenarios and were added to the study area roadway network. The potential increases in traffic volumes include vehicle trips generated by future background growth, or specific, non-Hanscom developments planned or programmed in the area by the towns, as well as forecast activity growth at Hanscom Field. In addition to the components of future traffic growth, this section describes planned roadway improvements in the area and their expected effects on the transportation network.

The analysis identified traffic increases on key roadways such as Route 2A and conducted level-of-service (LOS) analysis for study area intersections where Hanscom Field traffic represents 10 percent or more for any traffic movement, as required by MEPA.

6.3.1 Future Background Growth

Future growth in traffic volumes occurs because of regional background growth and the traffic associated with specific plans/developments in the individual towns. This section describes background growth trends and planned developments within the towns of Bedford, Concord, Lexington, and Lincoln.

Regional Background Growth

To develop future traffic networks, a general growth rate was determined to account for the increase in all non-Hanscom related trips in the analyzed roadway network. For this effort, four sources of information were reviewed including 1) the seasonally-adjusted turning movement counts for both the 2012 and 2017 *ESPR*; 2) the seasonally-adjusted ATR volumes for both the 2012 and 2017 *ESPR*; 3) the five-year traffic growth measured at nearby MassDOT continuous count stations; and 4) projections of vehicle miles traveled (VMT) for the four Hanscom Field area towns (Bedford, Concord, Lexington, and Lincoln) from the Boston Region MPO published in 2012. A summary of this data is provided in Table 6-13.

Table 6-13 Background Traffic Growth Sources Reviewed for 2017 ESPR

Source	Commentary
2012 and 2017 ESPR Peak Hour Turning Counts	<ul style="list-style-type: none"> ⇒ AM Peak Period experienced an average of a 0.51 percent annual increase in traffic volumes between 2012 and 2018. ⇒ PM Peak Period experienced an average of a 0.78 percent annual increase in traffic volumes between 2012 and 2018.
2012 and 2017 ESPR Automated Traffic Recorders (ATRs)	<ul style="list-style-type: none"> ⇒ Review of the seasonally adjusted weekly counts by the automated traffic recorders in 2012 and 2018 at four locations shows an average annual growth of 0.07 percent. ⇒ These four locations include: 1) Bedford Road South of Route 2A, 2) Cambridge Turnpike Cutoff South of Lexington Road, 3) Old Bedford Road south of Bedford Street, and 4) Bedford Street west of Old Bedford Road.
MassDOT Continuous Count Stations	<ul style="list-style-type: none"> ⇒ Station H8509 on I-95 at Route 2A experienced an average annual increase of 1.21 percent between the years of 2012 and 2017. ⇒ Station 4013 on Route 2 just west of I-95 experienced an average annual increase of 0.50 percent between the years of 2012 and 2017. ⇒ Station 403 on Route 2 just East of Commonwealth Ave in Concord experienced an average annual increase of 1.21 percent between the years of 2012 and 2017.
Boston Region Metropolitan Planning Organization	<ul style="list-style-type: none"> ⇒ The Boston Region MPO predicts an average annual VMT growth of 0.40 percent between the years 2018 and 2025 for the four-towns in the Hanscom Field area (Bedford, Concord, Lexington, and Lincoln). ⇒ The Boston Region MPO predicts an average annual VMT growth of 0.65 percent between the years 2025 and 2035 for the four-towns in the Hanscom Field area (Bedford, Concord, Lexington, and Lincoln).
Note: While 2 other locations were counted for this project, these were not included in this analysis as one counter was placed on Hanscom Drive north of Old Bedford Road and the other at Route 2A east of Airport Road was miscounted in the original dataset for the 2012 ESPR. Source: FHI, 2018	

Based on review of this data, a background traffic growth rate of 0.75 percent per year between 2018 and the 2025 model year was used to reflect a blended rate that considers recent traffic growth trends and predictions from the Boston Region MPO. A 0.65 percent annual growth rate between 2025 and 2035 was used to reflect the recommendations by the Boston Region MPO. It should be noted that while higher growth has been observed at the MassDOT Continuous Count Stations, it appears from other datasets that this level of growth has not been seen on non-arterial roadways in the study area. Therefore, the near-term annual growth rate of 0.75 percent reflects a conservative blend of these values. This represents a higher growth rate than otherwise expected if evaluating traffic growth based on MPO VMT projections and the difference in traffic counts between the *2012 ESPR* and the *2017 ESPR*. However, the high growth seen at the MassDOT Continuous Count Stations led to the selection of higher traffic growth numbers.

For the 2025 to 2035 period, the model applies a 0.65 percent annual growth rate to reflect the recommendations by the Boston Region MPO. The MPO rate was chosen for the ten-year period from 2025 to 2035 since it was determined that previous trends from the 2012 and 2017 *ESPR* documents might be inconsistent with long-term traffic growth projections.

Planned and Potential Future Developments

A review of planned, future developments indicated that development within the study area is limited to the addition of 675 jobs to the Hanscom AFB campus. As these new jobs will be originating from outside the campus, AFB trips in the background development were increased to appropriately represent potential future conditions.

While a traffic study for these additional jobs could not be obtained, the additional impact to traffic was estimated by scaling the number of trips proportional to the increase in employment that the AFB will see in the coming years. U.S. Census (2015) estimates that approximately 3,400 employees currently work at the AFB, therefore, an increase of 675 jobs will result in approximately 20 percent more trips to and from the AFB during peak hours. The 20 percent increase in trips was applied to only those trips originating from and destined to the Hanscom AFB Vandenburg Gate located on Old Bedford Road. These additional trips were then distributed through the network given the same proportional distribution as used in 2018 morning and afternoon peak hour trip distribution networks. Trips originating from and destined to the Hartwell Gate or the Lincoln Labs gates were not included in the analysis; an increase in traffic/trips at these gates may impact traffic at the Route 4/225 and Hartwell Avenue intersection, however the lack of count information at the gate locations prohibits this estimation. It should also be noted that the background growth between 2025 and 2035 was not applied to these additional trips.

6.3.2 Hanscom Field Future Traffic Volume Scenarios

To assess the potential future traffic impacts of Hanscom Field-related trips, trips generated by possible future activity at Hanscom Field for the 2025 and 2035 forecasts were estimated. Vehicular traffic at Hanscom Field is generated by both general and commercial aviation activities, and other airport-related land uses. General aviation (GA) includes flights for training, personal use, and business/corporate use. Future growth estimates for airside operations (GA, commercial aviation, and light cargo operations) were based on aviation forecasts presented in Chapter 3. Future growth based on these forecasts was applied to existing peak hour activity levels at Hanscom Field to estimate the number of new weekday morning and afternoon vehicular trips generated by aviation activities under each of the two future scenarios. Future trips largely derive from the addition of commercial service as noted in Chapter 3.

Table 6-14 presents vehicle trip generation estimates for current and the 2025 and 2035 scenarios. In general, the 2017 *ESPR* Hanscom Field trip generation estimates for future years are lower than the forecasted rates in the 2012 *ESPR*. These differences reflect a reduction of aviation activity at Hanscom Field since 2012. The 2012 *ESPR* growth scenarios also included traffic from an airport-based hotel and aviation museum, neither of which were developed

between 2012 and 2017. However, some type of aviation-compatible development is still possible by 2035 for these two parcels in the West Ramp area (as indicated in Table 4-8) but are not included in the trip generation estimates in Table 6-14 because specific details for future development are not currently known. A full report on projected trip generation by year is presented in Appendix C.

Table 6-14 Hanscom Field Trip Generation for 2025 and 2035 Scenarios

Scenario	Morning peak hour			Afternoon peak hour		
	In	Out	Total	In	Out	Total
2018	74	36	110	32	75	107
2025 Forecast	90	48	138	40	85	125
2035 Forecast	106	61	167	48	98	146
2012 ESPR Scenarios						
2020 Forecast	178	42	220	46	120	166
2030 Forecast	291	99	390	122	223	345
Source: FHI, 2018						

As mentioned, two sites in the West Ramp area continue to be identified as strategic reserves for development in the 2035 scenario (see Table 4-8). While no specific proposals currently exist, the sites could accommodate a range of potential developments. The possible types of development could generate a range of traffic impacts, such as the hotel, conference center, or museum previously considered. As such, and for purposes of this study, up to 150 new morning peak hour and 180 new afternoon peak hour trips could be generated. These trips would likely access Hanscom Field primarily from Route 2A and would contribute to traffic at the main entrance to the site at Hanscom Drive and Route 2A. When this potential development is more specifically defined, its impacts on traffic at specific locations (as well as air quality and natural resources) can be more fully evaluated.

6.3.3 Hanscom Field Trip Distribution

To account for increased development at the Pine Hill area (adjacent to Virginia Road) and the North Airfield area (located on Hartwell Road), traffic was first estimated and assigned to either the Terminal Area access, the Pine Hill access, or the North Airfield access. This estimation process is detailed in Appendix C and the assumptions are summarized below in Table 6-15. While the trip assignment to other Hanscom access points was not considered in the 2012 *ESPR*, it was determined that these access points would account for a proportion of new future aviation activity, therefore they were included in the 2017 *ESPR*. While Table 6-15 indicates that 25 percent of GA trips will be assigned to the North Airfield Access in 2035, it should be noted that, based on trip generation estimates provided in Appendix C, no more than 5 vehicles were assigned to any particular movement on the Hartwell Road access in either the morning or

afternoon peak hours as shown in the following figures for the 2025 and 2035 distribution results.

Table 6-15 Hanscom Field Trip Distribution Assumptions

Location	2025 Assumptions	2035 Assumptions
Pine Hill Access	Receives 2017 Trips + 10 percent of 2025 GA Trips	Receives 2017 Trips + 15 percent of 2035 GA Trips
North Airfield Access	Receives 20 percent of 2025 GA Trips	Receives 25 percent of 2035 GA Trips
Terminal Area	Receives remainder of GA trips, receives all commercial related trips, receives all 'other'-based trips	Receives remainder of GA trips, receives all commercial related trips, receives all 'other'-based trips
Source: FHI, 2018		

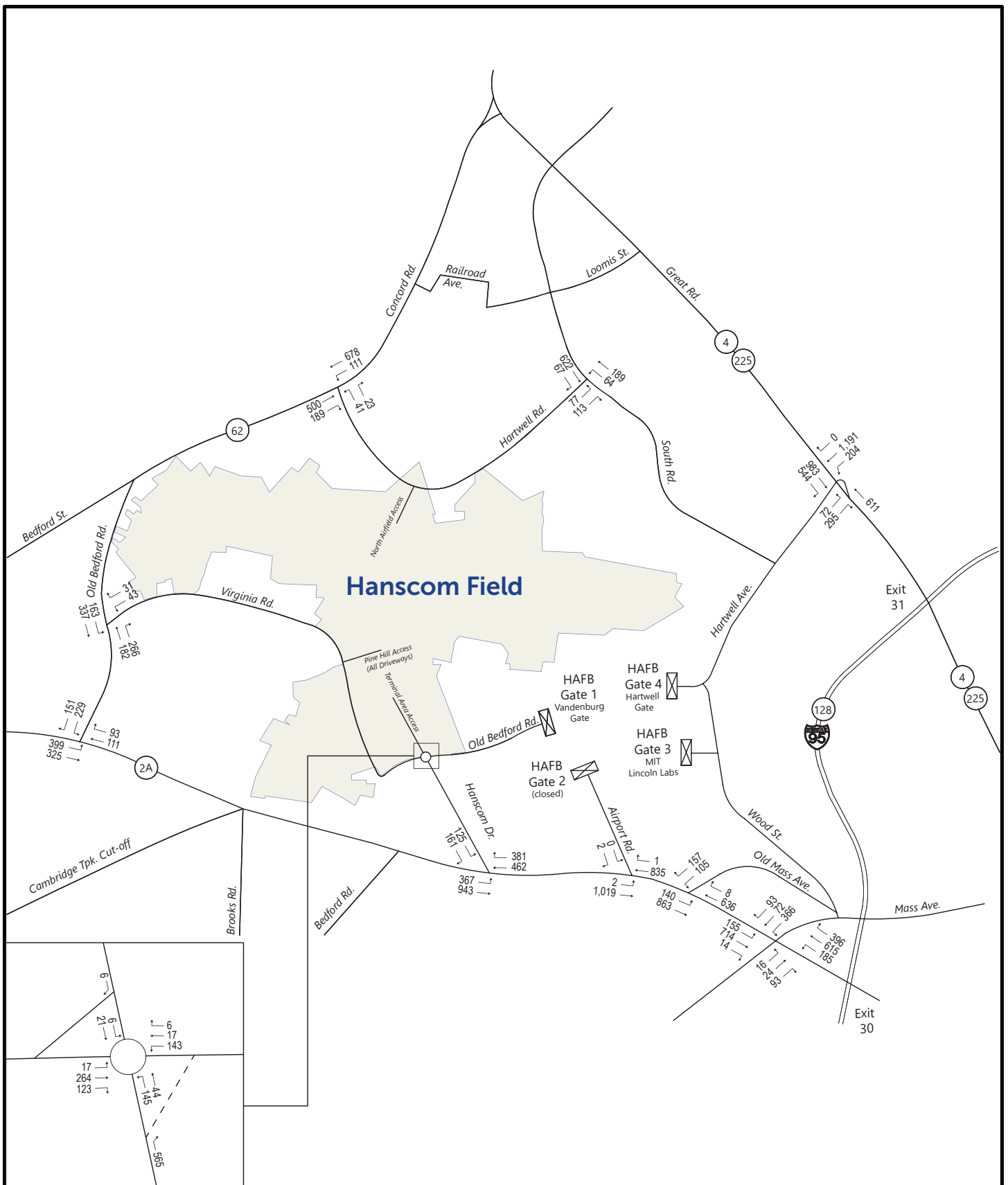
Table 6-16 shows the distribution of all trips aggregated by driveway access in the current and future scenarios as a percentage of total trips either inbound or outbound to Hanscom Field. This table shows that even with future development outside the Terminal Area, the majority of trips into and out of the airport will still be found at this access point on Hanscom Drive. Based on the assumptions above, no less than 65% of trips in any one direction (inbound or outbound to Hanscom Field) is slated to occur throughout the forecast years (in the 2035 forecast year, 65% of vehicles destined to Hanscom Field are estimated to use the main entrance at Hanscom Drive to access the Terminal Area while the remaining 35% are estimated to access either the Pine Hill or North Airfield access points). Thus, Table 6-16 shows that even with the development of future GA facilities at both the North Airfield and Pine Hill areas, the predominant access to Hanscom Field will remain at Hanscom Drive.

Table 6-16 Trip Distribution by Driveway

Scenario	Location	Morning peak hour		Afternoon peak hour	
		In	Out	In	Out
2017	Pine Hill	11%	11%	12%	11%
	North Airfield	0%	0%	0%	0%
	Terminal Area	89%	89%	88%	89%
	Total	100%	100%	100%	100%
2025 Forecast	Pine Hill	16%	13%	17%	17%
	North Airfield	9%	6%	13%	8%
	Terminal Area	75%	81%	70%	75%
	Total	100%	100%	100%	100%
2035 Forecast	Pine Hill	17%	15%	23%	18%
	North Airfield	9%	5%	12%	10%
	Terminal Area	74%	80%	65%	72%
	Total	100%	100%	100%	100%

Source: FHI, 2018

Trips destined to and originating from the Terminal Area access were then distributed based on existing trip distribution patterns as in the *2012 ESPR*. Volumes at intersections that were not counted for the *2017 ESPR* were estimated using 2012 travel patterns and the 2018 ATR count. Traffic originating from and destined to the Pine Hill area was distributed using the same method used for the Terminal Area access. Traffic originating from and destined to the North Airfield area was assigned to entry and exits into the network at Bedford Street towards Concord to the southwest, with Concord Road towards Bedford to the north and Route 4/225 to the southeast. These trips were assigned and estimated based on estimated travel patterns of traffic accessing the Terminal Area. Figure 6-17 through Figure 6-28 2035 present future traffic volume scenarios as analyzed in the *2017 ESPR*.



North
↑
NOT TO SCALE

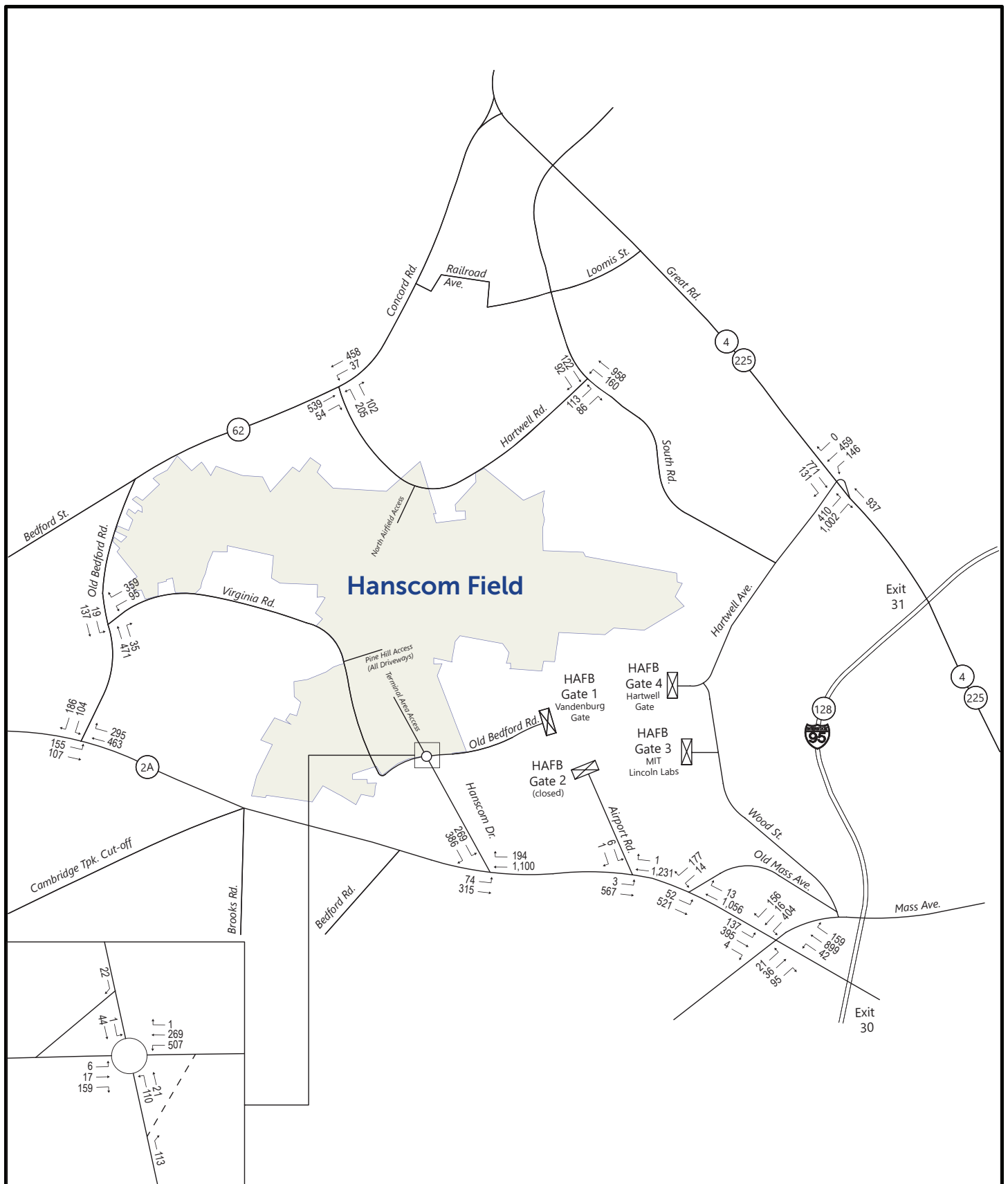


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2025 Background Growth Only
Morning Peak Hour Traffic Volumes**

Figure 6-17



North
↑ NOT TO SCALE

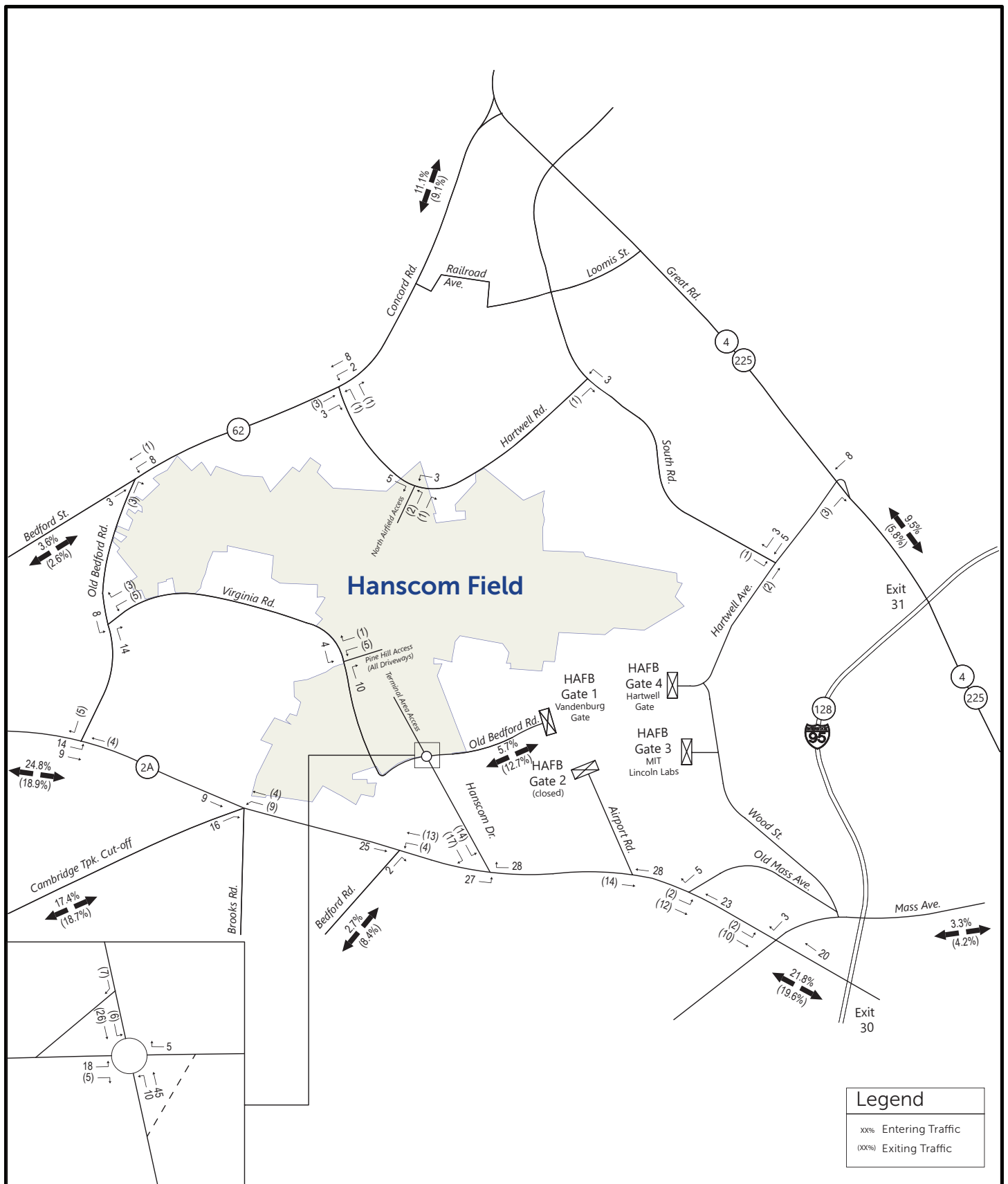


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2025 Background Growth Only
Afternoon Peak Hour Traffic Volumes**

Figure 6-18



North
↑
NOT TO SCALE

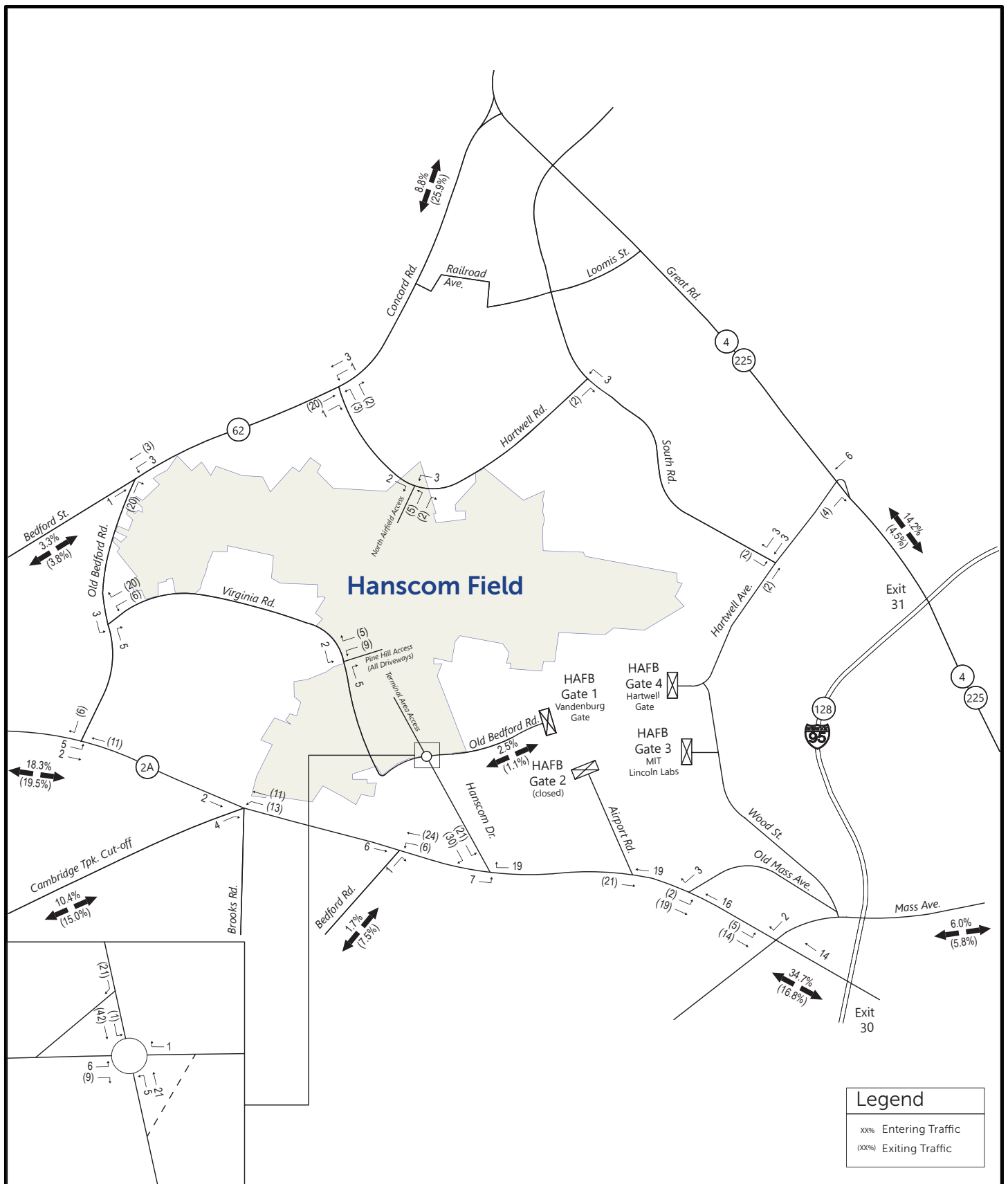


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2025 Morning Peak Hour
Trip Distribution (Hanscom Field Only)**

Figure 6-19



North
↑
NOT TO SCALE

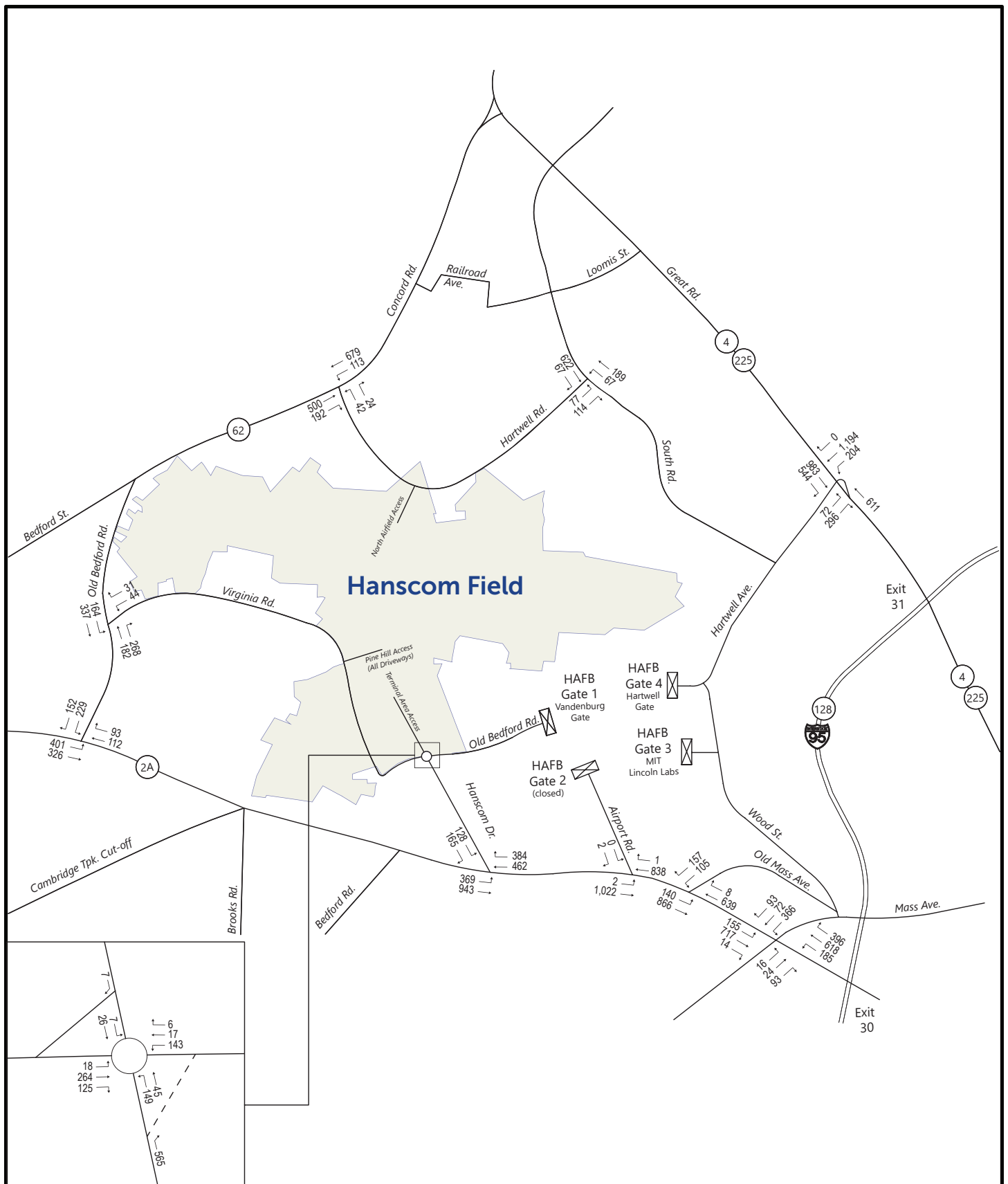


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2025 Afternoon Peak Hour
Trip Distribution (Hanscom Field Only)**

Figure 6-20



North
↑
NOT TO SCALE

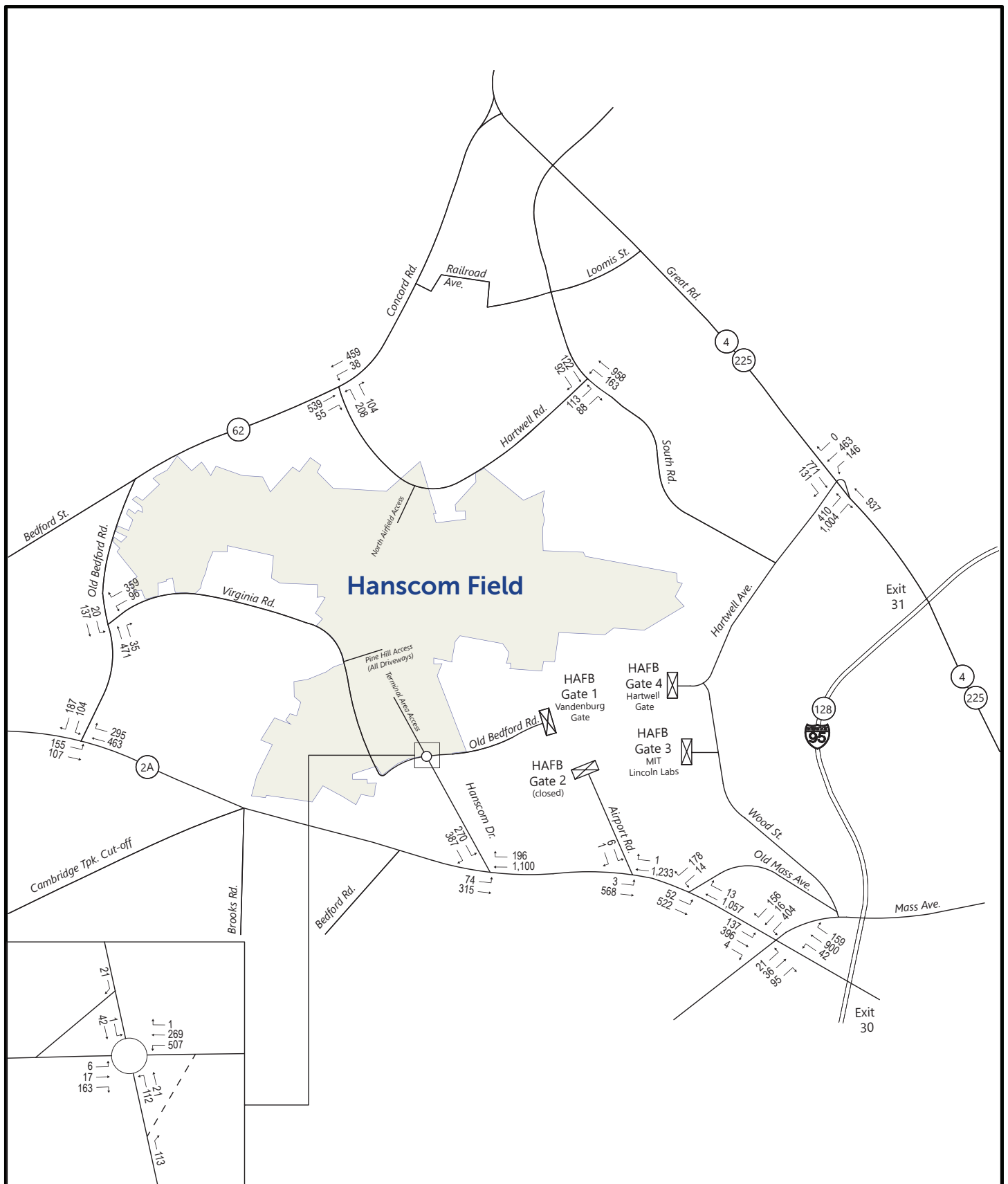


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2025 Hanscom and Background Growth
Morning Peak Hour Traffic Volumes**

Figure 6-21



North
↑
NOT TO SCALE

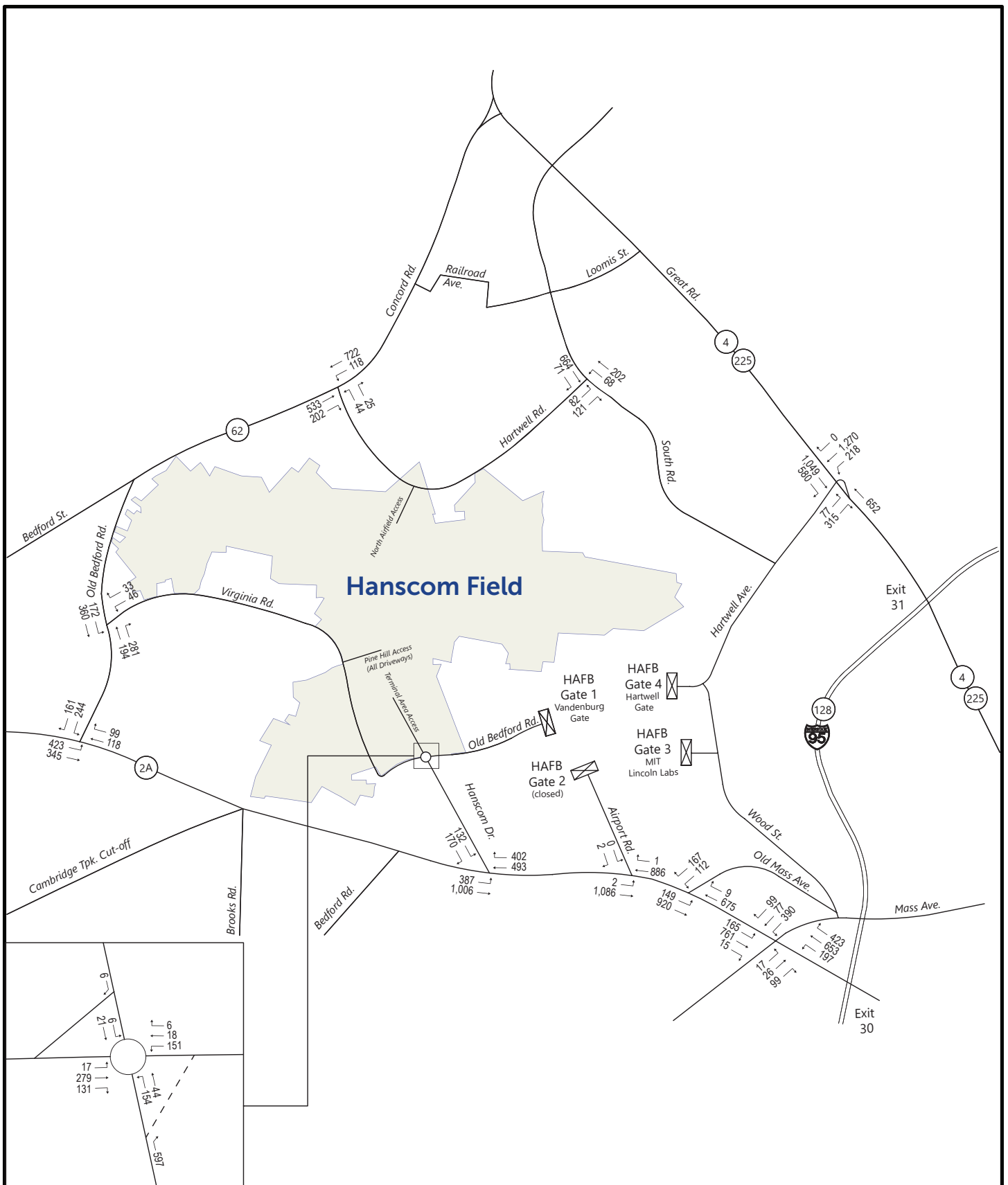


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2025 Hanscom and Background Growth
Afternoon Peak Hour Traffic Volumes**

Figure 6-22



North
↑
NOT TO SCALE

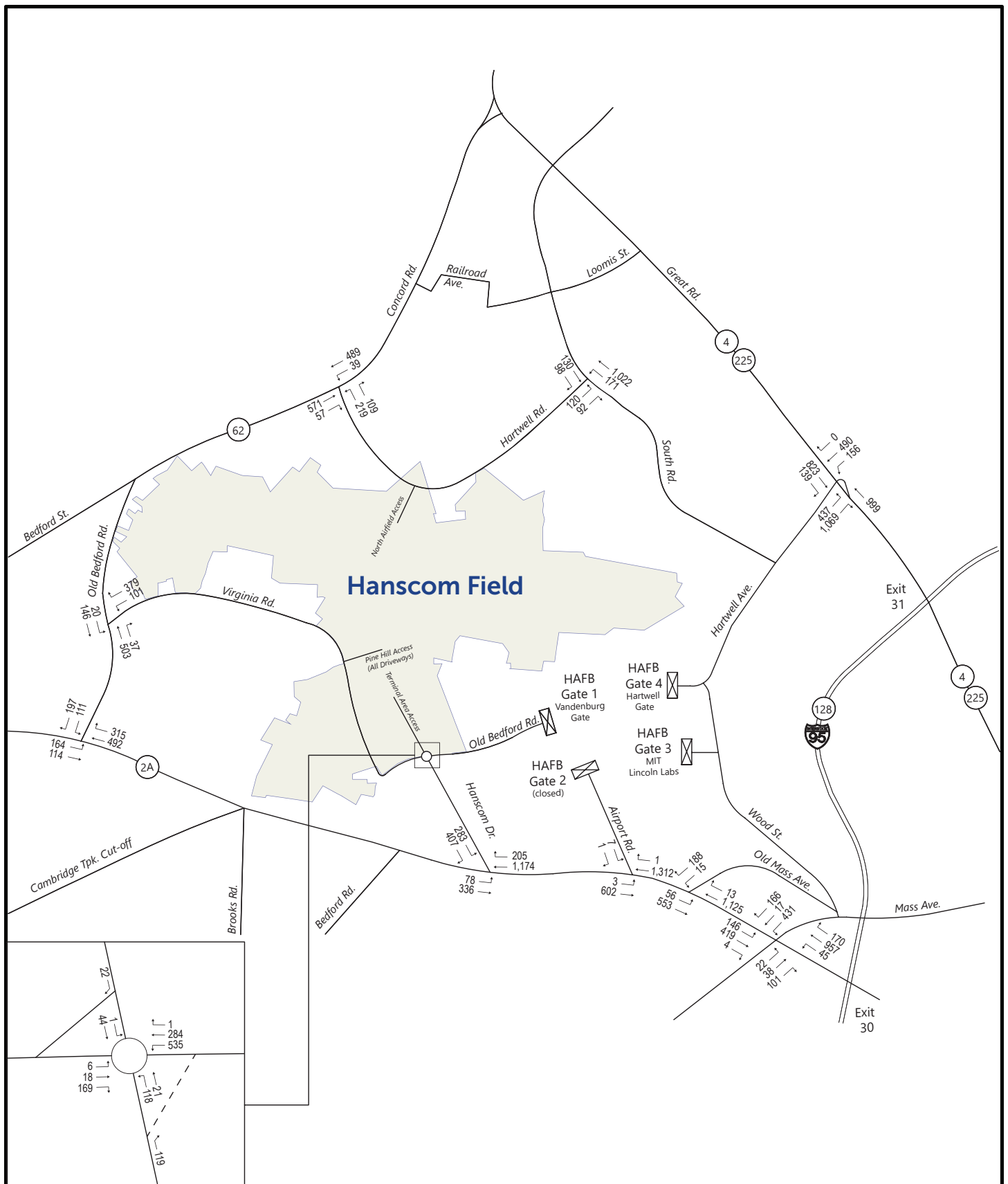


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2035 Background Growth Only
Morning Peak Hour Traffic Volumes**

Figure 6-23



North
↑
NOT TO SCALE

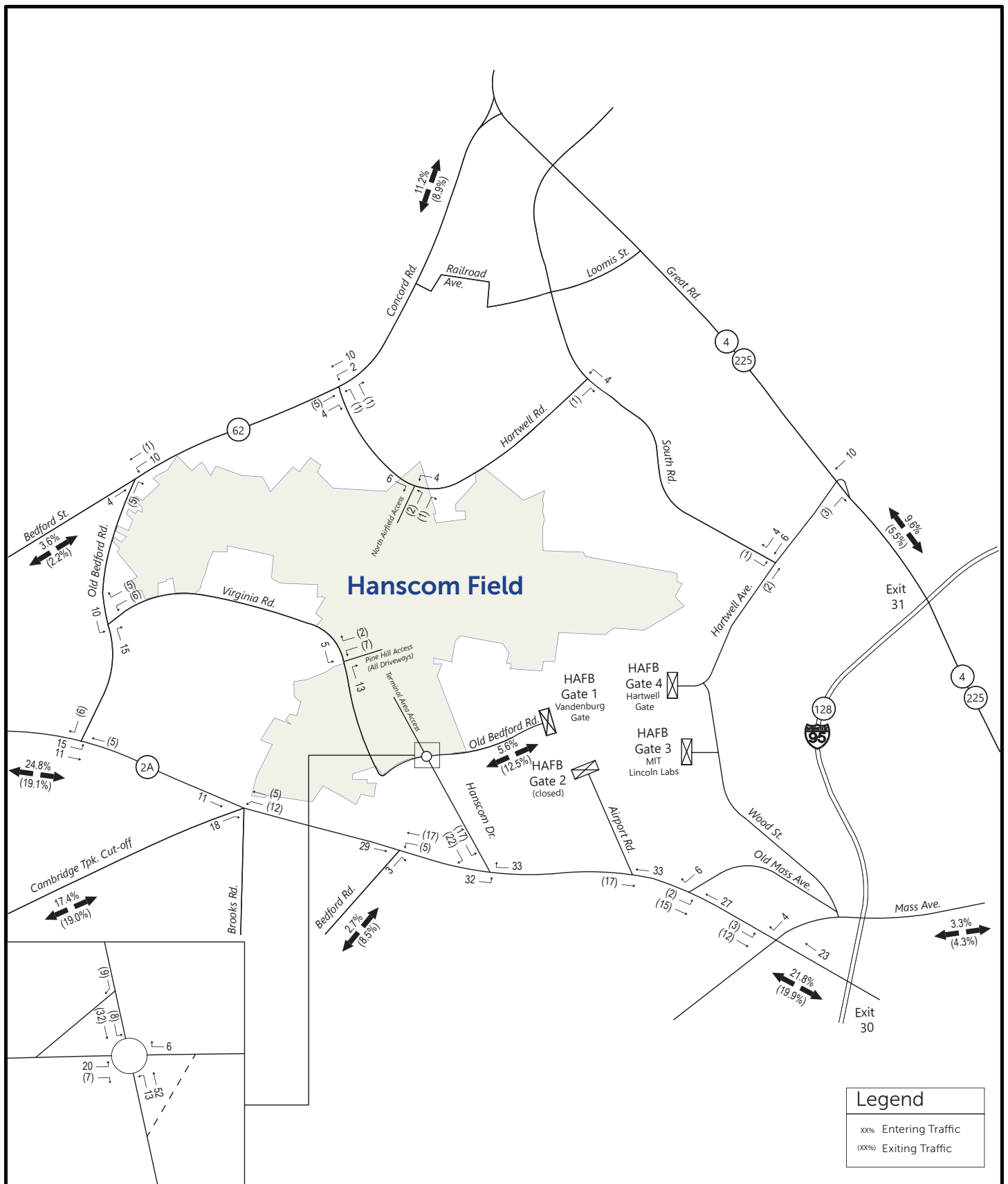


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2035 Background Growth Only
Afternoon Peak Hour Traffic Volumes**

Figure 6-24



North
↑
NOT TO SCALE

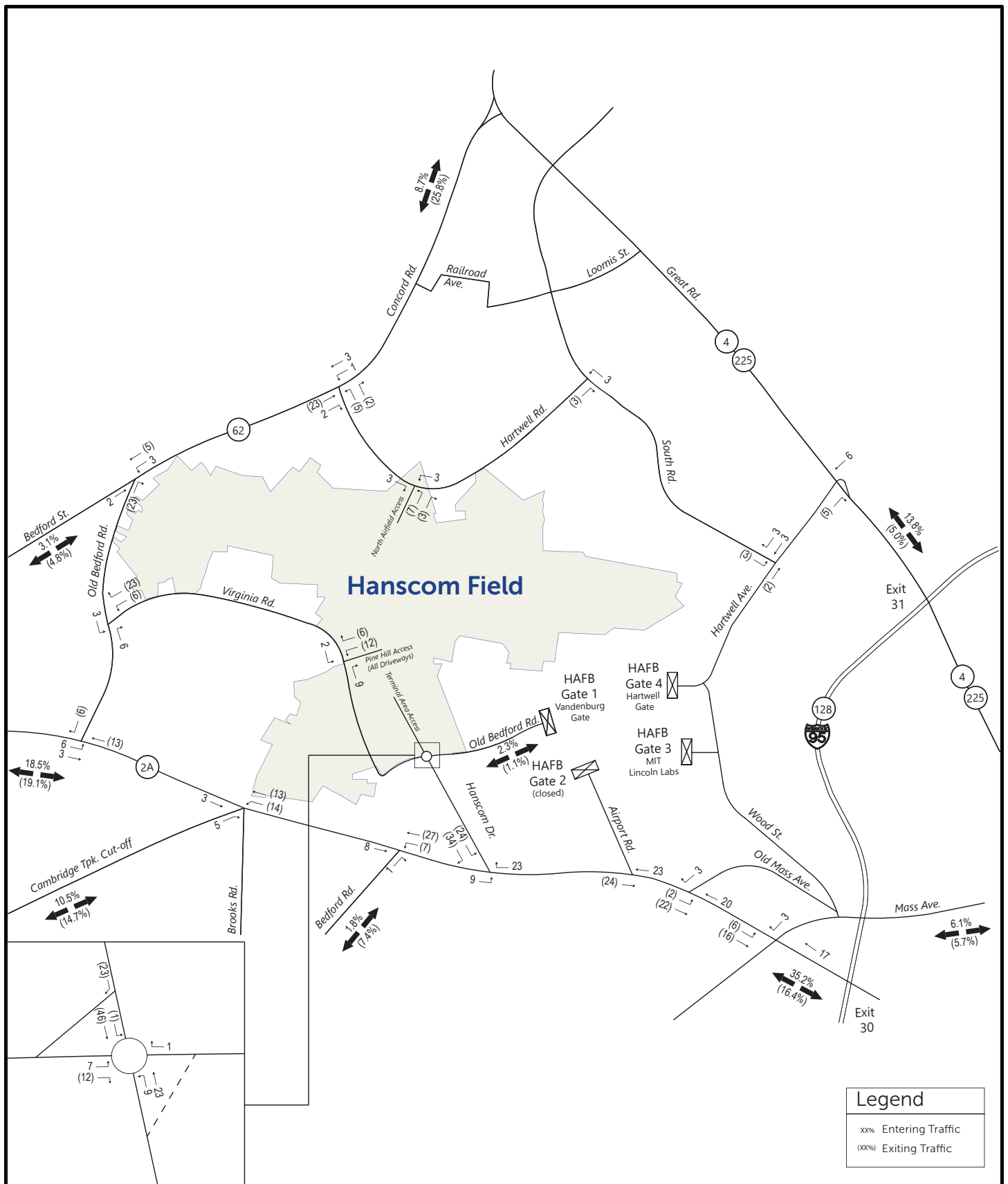


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2035 Morning Peak Hour
Trip Distribution (Hanscom Field Only)**

Figure 6-25



North
↑
NOT TO SCALE

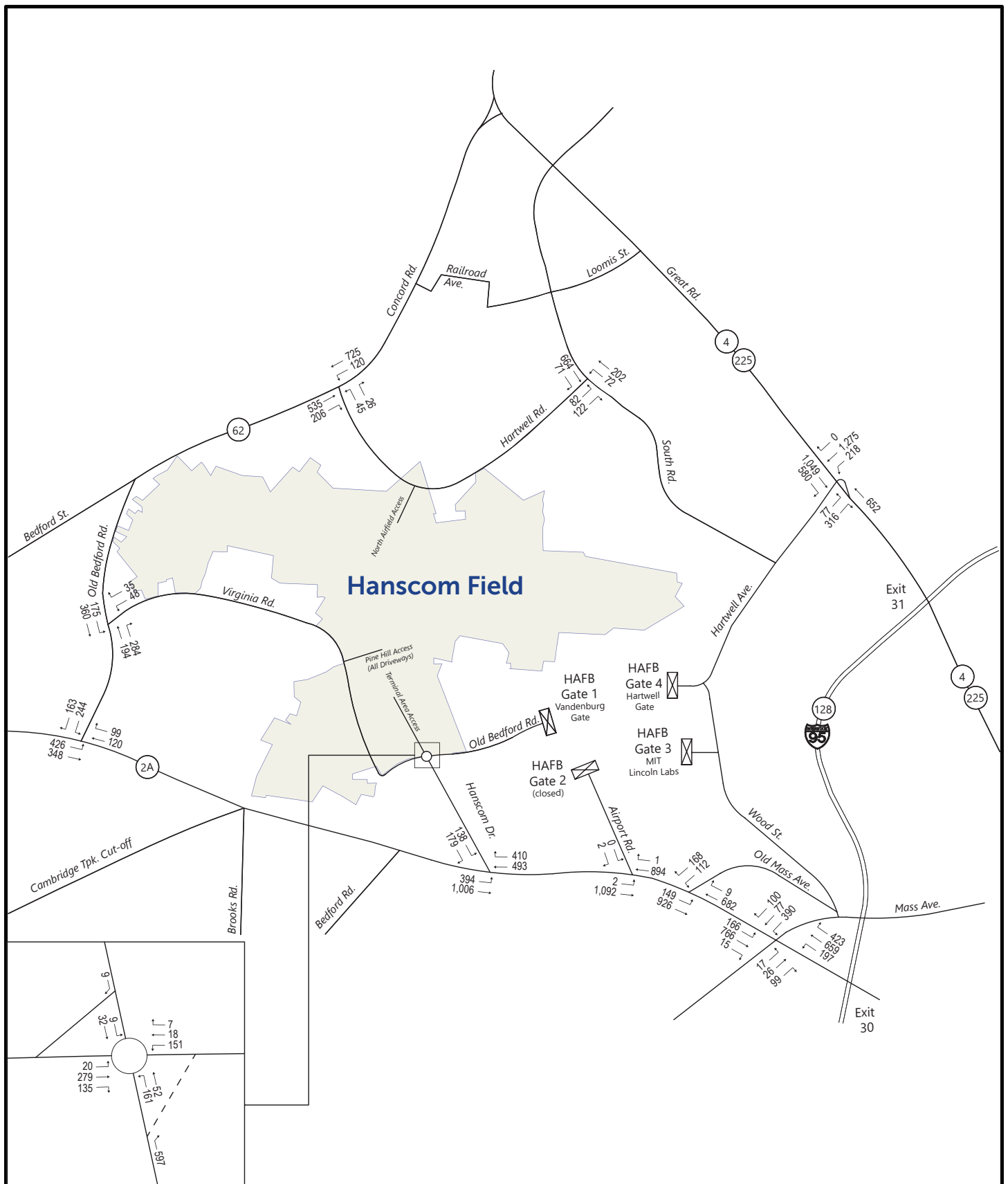


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2035 Afternoon Peak Hour
Trip Distribution (Hanscom Field Only)**

Figure 6-26



North
↑
NOT TO SCALE

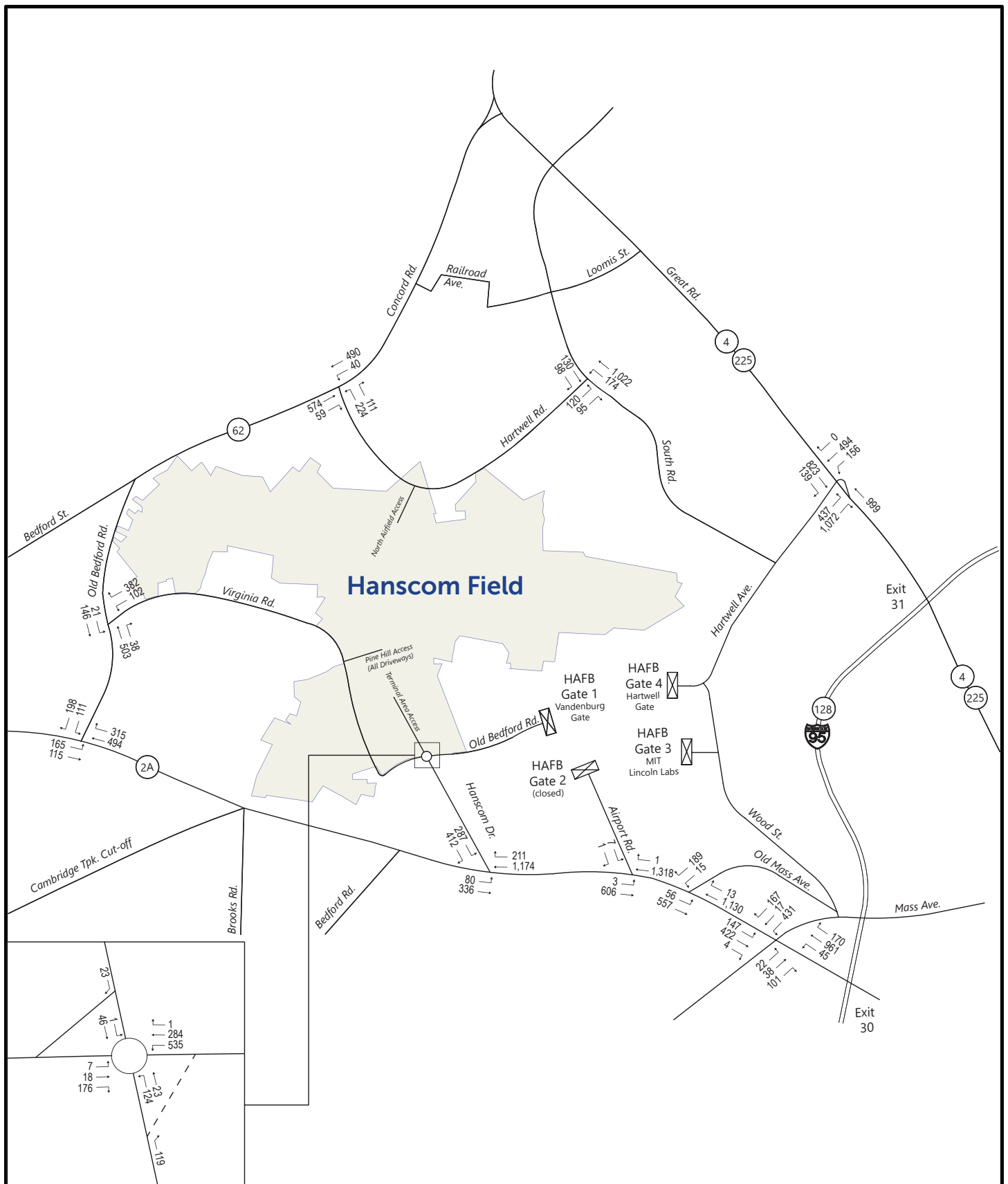


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2035 Hanscom and Background Growth
Morning Peak Hour Traffic Volumes**

Figure 6-27



L. G. Hanscom Field

2017 Environmental Status & Planning Report

**2035 Hanscom and Background Growth
Afternoon Peak Hour Traffic Volumes**

Figure 6-28

6.3.4 Planned Roadway Improvements

In order to analyze future intersection operations and build a comprehensive set of recommendations, it is necessary to understand planned and proposed roadway improvements in the study area.

The modification of the intersection of Hanscom Drive and Old Bedford Road through a Hanscom AFB project as described earlier in this chapter is a key project affecting traffic operations into and out of Hanscom Field. This improvement project will install a modern, single-lane roundabout at this location and is expected to be operational by 2025; therefore it is used to evaluate capacity results in the 2025 and 2035 planning scenario. Capacity results for the 2025 and 2035 volumes under the existing configuration are included in the appendix for reference.

Review of other ongoing planning efforts, as detailed earlier in this chapter, revealed that the future identified modifications to Route 4/225 and Hartwell Avenue are the only other relevant projects. However, since this project is not on the Transportation Improvement Program (TIP), funding has not yet been identified and thus not included in either the 2025 or 2035 scenario.

In order to provide a conservative analysis of the 2025 and 2035 scenarios; only the modification of Hanscom Drive and Old Bedford Road to a single-lane roundabout was assumed.

6.3.5 Capacity Analysis

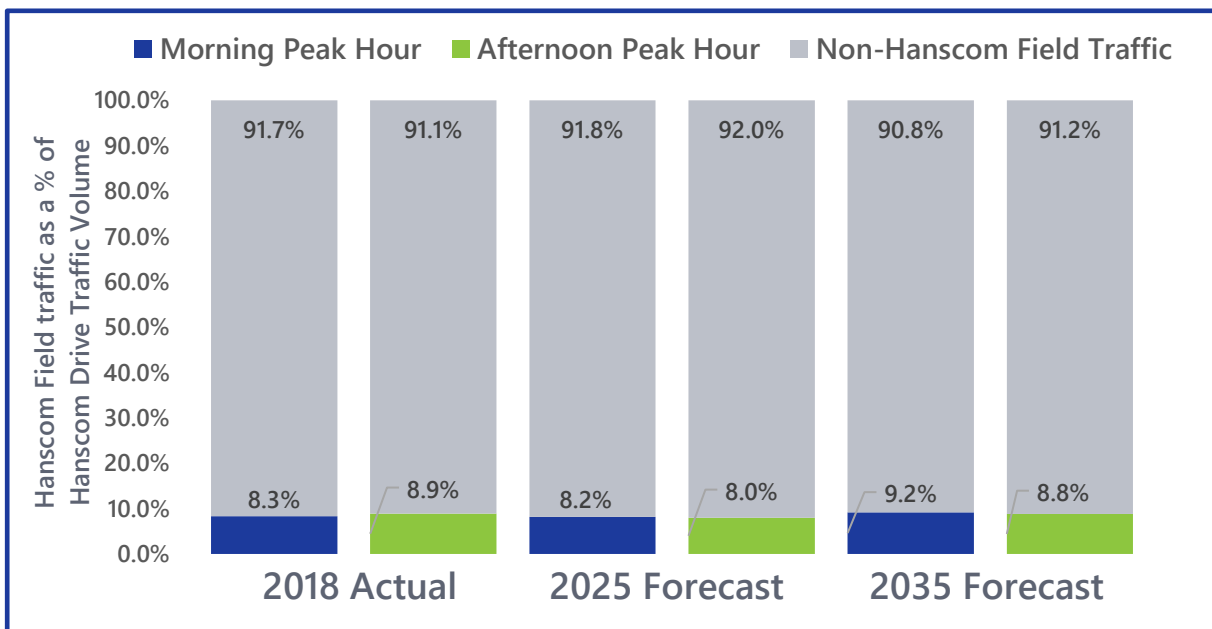
In order to quantify to impacts of expected changes in activity at Hanscom Field on the ground transportation network, a capacity analysis of intersections with movements accounting for more than 10 percent of total volume were analyzed for the following conditions:

- ⇒ 2025 and 2035 morning and afternoon peak hour networks, including background growth but without Hanscom Field traffic growth;
- ⇒ 2025 and 2035 morning and afternoon peak hour networks including both background and Hanscom Field traffic growth.

Hanscom Drive Traffic Volumes

Figure 6-29 illustrates the percentage of Hanscom Field-related peak hour traffic volumes on Hanscom Drive for the Existing (2018) and the 2025 and 2035 forecast scenarios. In the 2025 forecast scenario, Hanscom Field traffic on Hanscom Drive, as a proportion of total traffic, is projected to decline by approximately 8 percent for the morning and afternoon peak periods. This is primarily due to the increase in future traffic at Hanscom AFB accessing the campus through the Vandenburg Gate. Therefore, it is expected that this Hanscom AFB growth will outpace the growth anticipated at Hanscom Field. Furthermore, the opening of the North Airfield development is expected to redistribute several peak hour trips away from the main access at Hanscom Drive.

Figure 6-29 Hanscom Field 2025 and 2035 Peak Hour Traffic Volumes as a Percent of Hanscom Drive Traffic Volume



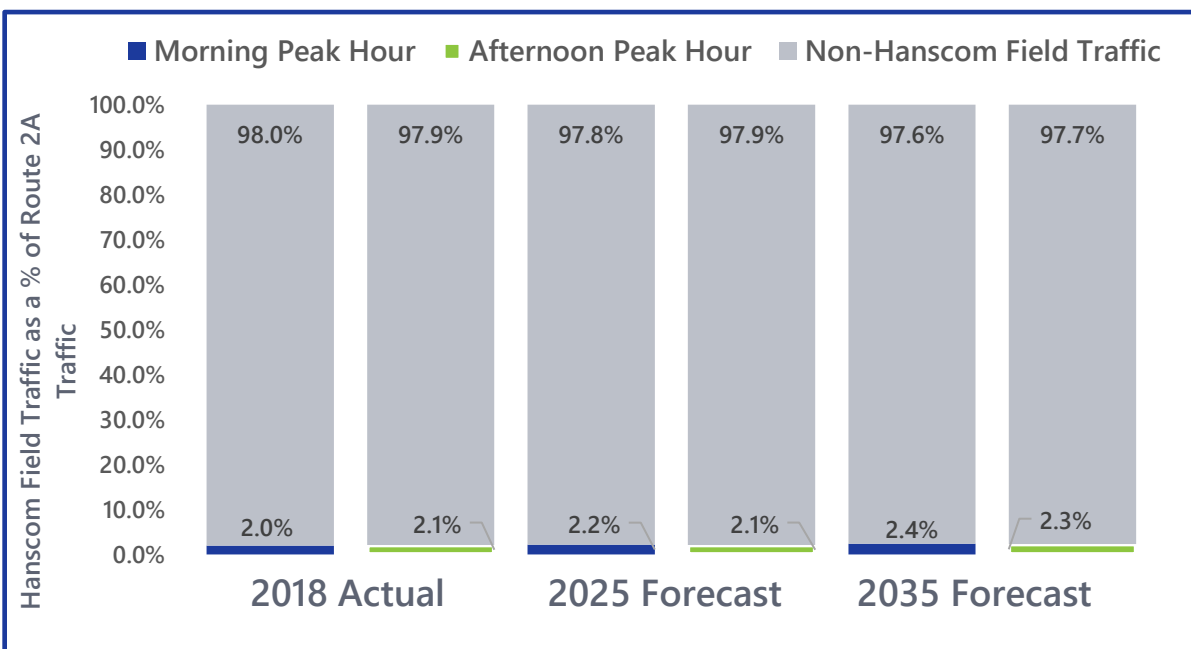
Source: FHI, 2018

For the 2035 forecast scenario, Hanscom Field traffic on Hanscom Drive is expected to return close to its current levels. This is because the growth projected at Hanscom Field is expected to outpace the general 0.65 percent growth rate applied to background traffic between 2025 and 2035. However, it should be noted that this is still much lower than the 2012 *ESPR* estimates, which predicted 22 percent of Hanscom Drive traffic (for the 2030 forecast year) to be destined to or originating from Hanscom Field. The traffic growth reflected in the 2017 *ESPR* reflects a more modest growth rate, which is supported with trends seen over previous *ESPR* documents.

Route 2A Traffic Volumes

Figure 6-30 illustrates the percentage of Hanscom Field-related peak hour traffic volumes on Route 2A for Existing (2018) and the 2025 and 2035 forecast scenarios. It is expected that Hanscom Drive traffic volumes measured as a percentage of total traffic on Route 2A would remain stable throughout the forecast years of the 2017 *ESPR*. This is a reduction in the findings of the 2012 *ESPR*, which found that in the 2030 forecast year, Hanscom Field-related traffic would account for roughly 7 percent of traffic on Route 2A east of Hanscom Drive.

Figure 6-30 Hanscom Field 2025 and 2035 Peak Hour Traffic Volumes as a Percent of Route 2A (East of Hanscom Drive) Traffic Volumes



Source: FHI, 2018

Future Intersection Analysis

Future intersection operations were evaluated for study intersections with movements that exceed the 10 percent threshold under the 2025 and 2035 forecasts. Table 6-17 shows the intersections that could have one or more traffic movements with 10 percent or higher Hanscom Field-related traffic volumes under the future 2025 and 2035 growth scenarios. The procedures described earlier in this chapter were used to determine future weekday, peak hour intersection operations. To identify the potential effects related to Hanscom Field and those that would be regional in nature, an analysis was also conducted for the 2025 and 2035 scenarios that assumed no growth in Hanscom Field traffic volumes. These "background growth only" scenarios were compared with the forecast scenarios for each future analysis year. Detailed traffic capacity analysis reports are included in Appendix C.

Table 6-17 shows that Hanscom Field traffic only exceeds the ten-percent threshold at three locations. This varies from ESPR documents, as shown earlier in this chapter in Table 6-6.

Table 6-17 Intersections Exceeding Ten-Percent Threshold

Intersection	Peak Hour	Analysis Years		
		2018 Existing	2025 Forecast	2035 Forecast
#5 Hanscom Drive/Old Bedford Road (Lincoln)	Morning	X	X	X
	Afternoon	X	X	X
#6 Hanscom Drive/Route 2A (Lincoln)	Morning	X	X	X
	Afternoon	X	X	X
#8 Old Bedford Road/Virginia Road (Concord)	Morning	X	X	X
	Afternoon	X	X	X
Note: "X" denotes intersection with turning movement exceeding 10 percent MEPA threshold Source: FHI, 2018				

2025 Forecast Scenarios

Table 6-18 and Table 6-19 present the comparison of traffic operations for the 2025 forecast scenarios with and without potential increases in Hanscom Field traffic, for the morning and afternoon peak hours, respectively. These results indicate that most intersections would operate at the same LOS or with only slight increases in delay regardless of Hanscom Field-related traffic growth. At the intersection of Route 2A and Hanscom Drive, the analysis indicates that the southbound movements would operate with significant delay during the morning and afternoon peak hours. However, as described in earlier in this chapter (Section 6.2.5), the analysis does not accurately represent actual operating conditions based on observations of several unique motorist behaviors at this intersection. Therefore, the expected delay in the 2025 forecast year is likely to be less than indicated by the Synchro results. However, the continuance of non-standard driving behavior, as described earlier in this chapter, creates a potential safety concern due to heavy traffic conditions projected to increase in future forecast years.

Modification of the intersection of Hanscom Drive and Old Bedford Drive to a single-lane roundabout is projected to improve operations in the 2025 forecast year over existing conditions. LOS results show notable improvements in traffic operations on many approaches to this intersection over existing conditions. Furthermore, the removal of the non-standard intersection design (i.e., where some approaches have multiple locations making it necessary for vehicles to yield) would further reduce control delay at this intersection. Hanscom Field development is expected to have a minimal impact on future operation of this new roundabout.

The increase in traffic volumes from all sources at the intersection of Old Bedford Road and Virginia Road would increase delay at this intersection. In particular, the westbound approach from Virginia Road is projected to experience measurable delay in both the morning and afternoon peak hours in both the no-build scenario and build scenario.

While the Synchro analysis indicates that these two movements (southbound approach at Hanscom Drive/Route 2A and westbound approach at Old Bedford Road/Virginia Road) are of concern in the 2025 forecast, attention to the difference between the no-build and build scenarios indicate that growth in projected Hanscom Field traffic has limited impact on the operational deficiencies of these intersections. Furthermore, analysis indicates that Hanscom Field will contribute approximately eight percent to 11 percent of traffic to these movements in the 2025 forecast year. As such, these operational deficiencies are largely the result of regional background traffic growth and traffic from planned and anticipated projects near Hanscom Field, not Hanscom-field related traffic.

Table 6-18 Level of Service for 2025 Forecast: Morning Peak Hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	5.7	0.21	A	5.8	0.22
Hanscom Drive SB	A	4.0	0.03	A	4.1	0.04
Old Bedford Road EB	A	7.3	0.39	A	7.4	0.40
Old Bedford Road WB	A	4.9	0.17	A	4.9	0.17
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	>300.0	6.55	F	>300.0	6.71
Hanscom Drive SB (R)	B	14.4	0.34	B	14.5	0.35
Route 2A EB (L)	B	10.5	0.39	B	10.5	0.40
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	D	27.1	0.45	D	27.9	0.46
Old Bedford Road SB (L)	A	9.0	0.16	A	9.1	0.17
Source: FHI, 2018						

Table 6-19 Level of Service for 2025 Forecast: Afternoon Peak Hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	3.6	0.11	A	3.6	0.11
Hanscom Drive SB	A	8.5	0.10	A	8.5	0.10
Old Bedford Road EB	A	8.2	0.27	A	8.3	0.28
Old Bedford Road WB	B	14.6	0.73	B	14.7	0.73
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	>300.0	4.26	F	>300.0	4.27
Hanscom Drive SB (R)	F	>300.0	1.78	F	>300.0	1.78
Route 2A EB (L)	B	12.1	0.17	B	12.1	0.17
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	F	180.6	1.31	F	182.8	1.32
Old Bedford Road SB (L)	A	9.0	0.04	A	9.0	0.04
Source: FHI, 2018						

2035 Forecast Scenarios

Table 6-20 and Table 6-21 present the comparison of traffic operations for the 2035 forecast scenarios, with and without potential increases in Hanscom Field- related traffic, for the morning and afternoon peak hours, respectively. These results indicate that most intersections would operate at the same LOS or with only slight increases in delay regardless of Hanscom Field-related traffic growth.

Similar to the 2025 forecast scenario, the intersection of Route 2A and Hanscom Drive would continue to experience the most operational deficiencies on the southbound approach from Hanscom Drive. The analysis indicates that the southbound movements would operate with lengthy delays during the morning and afternoon peak hours, regardless of Hanscom Field growth.

Furthermore, the 2035 forecast scenario indicates continued operational deficiencies at the intersection of Old Bedford Road and Virginia Road on the westbound approach. As a two-way, stop-controlled intersection, the Synchro analysis suggests that, as traffic volumes increase on Old Bedford Road and Virginia Road, there would not be enough adequately-sized gaps in traffic that would allow vehicles to make turns and efficiently flow through this intersection from the Virginia Road approach.

Finally, similar to the findings in the 2025 forecast scenario, the 2035 forecast scenario shows adequate traffic operations in the single-lane roundabout, which is expected to be constructed before the 2025 forecast year. With the exception of the westbound approach in the afternoon peak hour, the roundabout is expected to operate at LOS A. The westbound approach would operate at LOS C in the afternoon peak hour, which is considered to be adequate. Future growth in Hanscom Field traffic would have minimal impact to the operations of this intersection.

Similar to the 2025 forecast, however, the 2035 forecast analysis indicates that these operational deficiencies would exist at these intersections regardless of the forecasted growth at Hanscom Field. Furthermore, Hanscom Field would contribute approximately eight percent to 13 percent of traffic to these movements. As such, these operational deficiencies are likely a result of regional background traffic growth and traffic from planned and anticipated projects near Hanscom Field, not Hanscom-field related traffic.

Table 6-20 Level of service for 2035 forecast: morning peak hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	5.9	0.22	A	6.2	0.24
Hanscom Drive SB	A	4.1	0.03	A	4.3	0.05
Old Bedford Road EB	A	7.7	0.42	A	8.0	0.43
Old Bedford Road WB	A	5.0	0.18	A	5.2	0.18
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	>300.0	8.83	F	>300.0	9.78
Hanscom Drive SB (R)	C	15.3	0.38	C	15.6	0.40
Route 2A EB (L)	B	11.0	0.43	B	11.0	0.44
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	D	33.7	0.53	E	35.7	0.56
Old Bedford Road SB (L)	A	9.2	0.18	A	9.3	0.18
Source: FHI, 2018						

Table 6-21 Level of service for 2035 forecast: afternoon peak hour

Intersection	No-Build Scenario			Build Scenario		
	LOS	Delay [s]	v/c	LOS	Delay [s]	v/c
#5 Hanscom Drive/Old Bedford Road (Single-Lane Roundabout)						
Hanscom Drive NB	A	3.7	0.12	A	3.7	0.12
Hanscom Drive SB	A	9.1	0.11	A	9.2	0.11
Old Bedford Road EB	A	8.8	0.30	A	9.1	0.32
Old Bedford Road WB	C	17.0	0.78	C	17.5	0.79
#6 Hanscom Drive/Route 2A						
Hanscom Drive SB (L)	F	>300.0	5.43	F	>300.0	5.59
Hanscom Drive SB (R)	F	>300.0	2.08	F	>300.0	2.11
Route 2A EB (L)	B	12.8	0.19	B	12.8	0.19
#8 Old Bedford Road/Virginia Road						
Virginia Road WB (L R)	F	249.9	1.47	F	258.2	1.49
Old Bedford Road SB (L)	A	9.2	0.04	A	9.2	0.05
Source: FHI, 2018						

6.4 Traffic Management Approaches

Analysis of the ten-intersection network presented earlier in the chapter reveals that Hanscom Field has limited operational impact on the ground transportation network in the area of Hanscom Field for the scenarios analyzed (2018 existing, 2025 forecast, and 2035 forecast). Hanscom Field accounts for 10 percent of individual turning movements at only three intersections: Hanscom Drive and Old Bedford Drive; Hanscom Drive and Route 2A; and Virginia Road and Old Bedford Road. Potential improvements for each of these three intersections have been identified in the following sections. It should be noted, however, that the improvements described are only general recommendations to alleviate current and projected operational problem areas. While Hanscom Field-related traffic impacts the operation of these intersections, these impacts are minimal compared to other users. Furthermore, future build-out estimates show minimal impact regardless of currently projected growth at Hanscom Field.

6.4.1 Hanscom Drive and Old Bedford Road

As discussed throughout this chapter, the intersection of Hanscom Drive and Old Bedford Road is expected to be modified to a single-lane roundabout through a Hanscom AFB-led project associated with gate improvements. The capacity analysis shows that this intersection would

operate efficiently throughout the future, even with expected traffic growth. Furthermore, the project is expected to clarify vehicular navigation through the intersection and improve transit accommodations with the inclusion of a bus pull-out south of the proposed roundabout on Hanscom Drive. Bike lanes along Hanscom Drive and sidewalks from the proposed bus pull-out and eastbound and southbound approaches with crosswalks also appear in initial drawings dated May 2018 by the US Army Corps.

These proposed modifications to this intersection are expected to alleviate findings in the travel survey conducted for this study which revealed that some motorists find this intersection confusing to navigate.

6.4.2 Hanscom Drive and Route 2A

Similar to the findings of the 2012 *ESPR* analysis, the intersection of Hanscom Drive and Route 2A continues to be operationally deficient, with the southbound movements lacking enough gaps to continue either east or west on Route 2A. The results of the Synchro analysis indicate that this approach is over capacity in the afternoon peak hour.

While the traffic analysis indicates that Hanscom Field-related traffic at this intersection represents a small proportion of total traffic volumes, operational and geometric changes at this intersection would improve conditions. Specifically, further study of the installation of a traffic signal could be evaluated. Initial review suggests that the criteria for a signal warrant would be met based on forecasted growth, and that a traffic signal may need to be installed at this intersection in the future. The TIP includes repaving Route 2A in 2023; modifications to this intersection could be considered at that time.

6.4.3 Virginia Road and Old Bedford Road

Analysis of current conditions at the intersection of Virginia Road and Old Bedford Road indicates that Virginia Road is currently operating slightly above capacity on the westbound approach. This condition is likely to worsen over the analysis years, as background traffic increases on Old Bedford Road, which would result in less acceptable gaps for traffic on Virginia Road. Widening the westbound approach to add dedicated left-turn and right-turn lanes could improve operations at this intersection and reduce problematic delays for this approach already experienced in the afternoon peak period. Additionally, the removal of nearby brush would improve sight lines for vehicles at Old Virginia Road looking at oncoming traffic from the north. Similar to the findings at the intersection of Hanscom Drive and Route 2A, this report finds that Hanscom Field-related traffic contributes a minority of traffic at the approaches to this intersection. However, as a key access point to Hanscom Field facilities, this intersection will continued to be monitored in future.

6.4.4 Transportation Demand Management

In addition to adding capacity to nearby transportation infrastructure, reducing peak-hour trips through transportation demand management (TDM) to and from Hanscom Field can improve conditions. While Hanscom Field operations are projected to continue to have a small impact on ground transportation infrastructure in the surrounding area, development of demand management programs could have mutually beneficial effects for area traffic conditions and employees/tenants at Hanscom Field alike. However, options are limited for managing vehicle demand – largely due to the geographic context in which Hanscom Field exists. As a large airport in a suburban environment, many traditional TDM strategies frequently promoted in urban areas are less suitable for implementation at Hanscom Field. Even so, the following sections describe the steps that could be undertaken at Hanscom Field to manage demand.

Enhancing Transit Connections

As discussed earlier in this chapter, Hanscom Field benefits from its proximity to the Fitchburg Line of the MBTA Commuter Rail, as well as a direct connection to the MBTA Route 76 bus route with service to the MBTA's Alewife Station (with direct service to the Red Line). As demonstrated in the Existing Conditions section of this chapter, service via the Route 76 bus route is slow and not convenient as a direct connection for Hanscom Field travelers. Not only does Route 76 operate as a local bus between Alewife Station and its terminus at Hanscom Field, the route is circuitous (see Figure 6-2) and is designed with preference to the larger employment base at the MIT-Lincoln Labs.

The Route 128 Business Council (128BC) continues to have success since it launched express bus service for commuters destined to Hartwell Avenue from Alewife Station. Coordination between Hanscom Field, Hanscom AFB, and the Virginia Road corporate neighbors on an express shuttle connecting these three facilities with either the MBTA Alewife Station or the MBTA Concord commuter station could increase transit options for daily commuters. An express shuttle could also be combined with a free, guaranteed ride home program to further increase transit options and use.

Furthermore, the on-going MassDOT RailVision and Better Bus Project plans have the potential to reimagine commuter rail transit and bus services in the region which will directly impact the accessibility of Hanscom Field from these systems.

Promoting Ride Share

Approximately 49 percent of the travel survey respondents indicated an interest in carpooling; however, only 9 percent of survey respondents actually carpool as a primary or secondary means of travel to and from Hanscom Field on a daily basis. Therefore, while ridesharing and carpooling may be a viable travel demand management strategy, the variability in daily commuter schedules the dispersion of employee origins, and the relatively low volume of peak-

hour commuters to and from Hanscom Field, may make carpooling programs difficult to establish and sustain. Other ways to reduce single occupancy vehicle (SOV) trips include:

- ⇒ Offer parking incentives to carpool participants (such as designative parking spaces close to destinations);
- ⇒ Promote app-based tools (e.g. Waze Carpool and NuRide) to provide ride-matching services with nearby employees with similar commutes.

6.4.5 Active Transportation

Since more than 98 percent of travel survey respondents live more than one mile away from Hanscom Field, walking is not a viable commute option. However, survey respondents noted that several local improvements could be made to enhance the pedestrian environment at Hanscom Field. Specifically, recommendations include:

- ⇒ Pedestrian improvements at the intersection of Hanscom Drive and Old Bedford Road to include crosswalks and sidewalks along Hanscom Drive to the Terminal Building. MBTA ridership data shows daily riders at the bus stop at this location, and pedestrian accommodations should be improved accordingly.
- ⇒ Enhanced pedestrian connections to the Battle Road Trail. Restriping on Old Bedford Road to remove the painted median could create increased flexible shoulder space, while also connecting to the branch of the Battle Road Trail located at the intersection of Virginia Road and Old Bedford Road (Lincoln).
- ⇒ Greater pedestrian connectivity at the Hanscom Field Main Terminal between all major facilities and parking locations.

While these improvements may not increase the number of walking trips to Hanscom Field, they may increase the number of walking trips to the Battle Road Trail for recreation or those between buildings/internal to Hanscom Field.

Cycling to and from Hanscom Field may provide a reduction in SOV trips. With approximately 26 percent of employees living 10 miles or less from Hanscom Field, and with 23 percent of survey respondents indicating an interest in cycling to Hanscom Field as an alternative means to their primary mode of travel, cycling may account for a larger mode share in the future. However, 70 percent of survey respondents indicated that bicycle facilities are not adequate to make cycling a viable commute option. Recommendations to improve the viability of cycling in the future include:

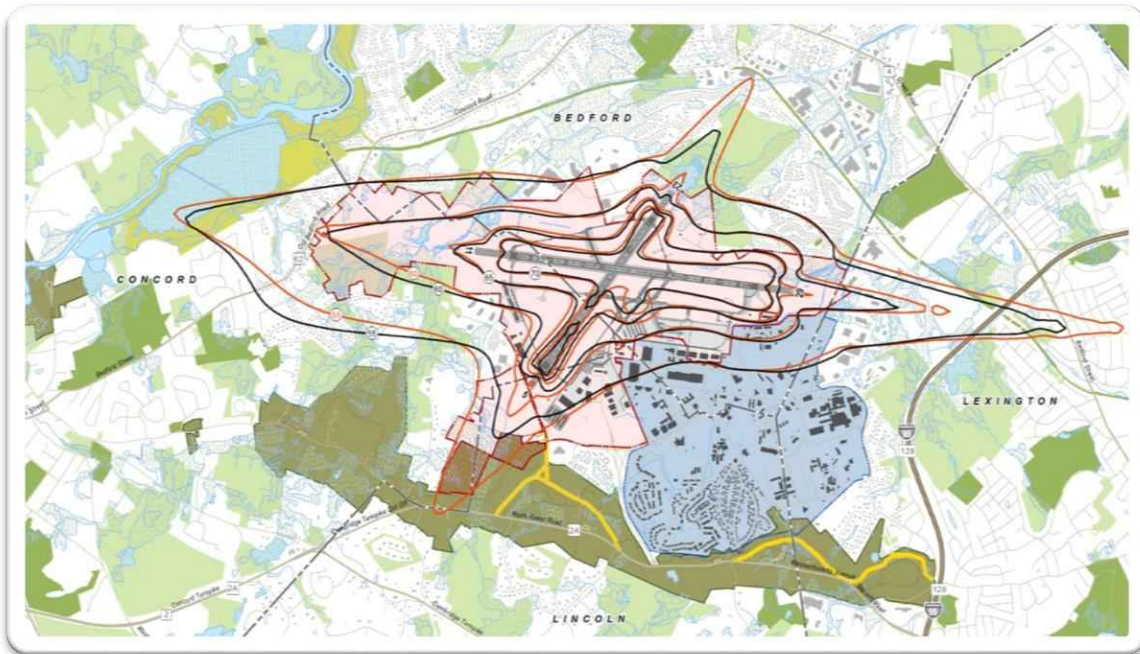
- ⇒ Improve cycling accommodations on Hanscom Drive between the Civil Air Terminal and Route 2A by converting existing shoulder space on Hanscom Drive to a bike lane and installing "Share the Road" signs at the southern and northern entrances to the drive.
- ⇒ Install "Share the Road" signs at bicycle crossing locations at the intersection of Hanscom Drive and Old Bedford Road and install bicycle chevrons on turning lanes

while maintaining consideration of bicycle users in any long-term plans to reconfigure the geometry of the intersection.

- ⇒ Improve Virginia Road to its intersection with Old Bedford Drive by installing bike chevrons and “Share the Road” signs along this route.

Expand the shoulder for bicyclists on Route 2A to the east to Massachusetts Avenue.

7 Noise



This chapter presents the noise conditions at Hanscom Field for 2017 to illustrate present conditions, and for the 2025 and 2035 scenarios to predict future noise for the airport activity levels forecasted. A broad array of metrics is used to describe noise conditions including Day-Night Sound Level (DNL), Time Above a decibel threshold (TA), Total Noise Exposure (EXP), and distribution of Sound Exposure Levels (SEL). Noise levels for each of the metrics are evaluated at noise-sensitive receptors including hospitals, schools, religious sites, public facilities, and sites on the National Register of Historic Places and/or State Register of Historic Places presented in the chapter by municipality. Massport's noise abatement program is also described, including how Massport is working with local stakeholders to assess noise and mitigate impacts.

The 2017 ESPR future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3 Airport Activity Levels. The 2025 and 2035 scenarios are estimates of what could occur (not what will occur) in the future using certain planning assumptions and are heavily dependent upon demand. The future service scenarios are fully consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

7.1 Key Findings Since 2012

Overall operations have decreased in at Hanscom Field over the last several years, and operations remain well below historical peaks. Noise also remains well below historical peaks, with the Day-Night Sound Level (DNL) 65 decibel (dB) contour entirely within Hanscom Field property.⁹⁰ However, there have been some increases in jet operations and nighttime flights. Forecast increases in general aviation (GA) jet activity contribute to the projected growth in operations to approximately 142,000 annual operations in 2035, driving a modest projected increase in overall noise levels as compared to today. These recent and projected trends align with Hanscom Field's role in New England's regional aviation system as the premier GA reliever for Logan International Airport.

Massport has continued to pursue measures to reduce noise impacts, including an initiative begun in 2009 to reduce noise over the Minute Man National Historical Park (MMNHP). Previously, touch-and-go operations circled to the south of the airport often taking the aircraft over areas of the Battle Road Trail that are used by the Park for outdoor programs and interpretive talks. A partnership of Massport, National Park Service (NPS), the FAA, the flight schools and Hanscom pilots determined that small aircraft could increase the use of a tight touch-and-go pattern that keeps the aircraft over the airfield rather than over sensitive park areas. Using radar data, Massport staff monitors the number of touch-and-go operations over the MMNHP. This data is a critical part of ongoing quarterly meetings between Massport, FAA air traffic control tower, and flight school staff to review touch-and-go flight paths. Since the initiation of this program, flights over MMNHP have been reduced by 22 percent.

Massport's Fly Friendly program at Hanscom Field continues to support quiet arrival and departure procedures, including supporting the use of the National Business Aviation Association's (NBAA's) noise abatement procedures for jet aircraft, publicizing the Aircraft Owners and Pilot Association's (AOPA's) noise abatement procedures for piston aircraft, and by developing and publicizing quiet flying procedures for helicopters. Part of this effort included the development of a multi-faceted publicity program that results in pilots

Key noise statistics since 2012 analysis:

- ⇒ The total population exposed to DNL greater than 65 dB remains at zero in 2017 (from zero in 2012), which is a decrease from 17 in 2005 (which were all in Bedford).
- ⇒ The total population in the four towns exposed to DNL values of 55 dB or greater increased from 1,041 residents in 2012 (down from 2,953 in 2005) to 1,271 in 2017 (see Table 7-1).
- ⇒ In all future scenarios, there are no residents exposed to noise levels exceeding 65 dB DNL.

⁹⁰ FAA land use compatibility guidelines generally consider aircraft noise greater than 65 dB DNL to be incompatible with residential and other noise-sensitive land uses. No residential land uses were exposed to a DNL value above the FAA land use compatibility recommendation of 65 dB in 2017.

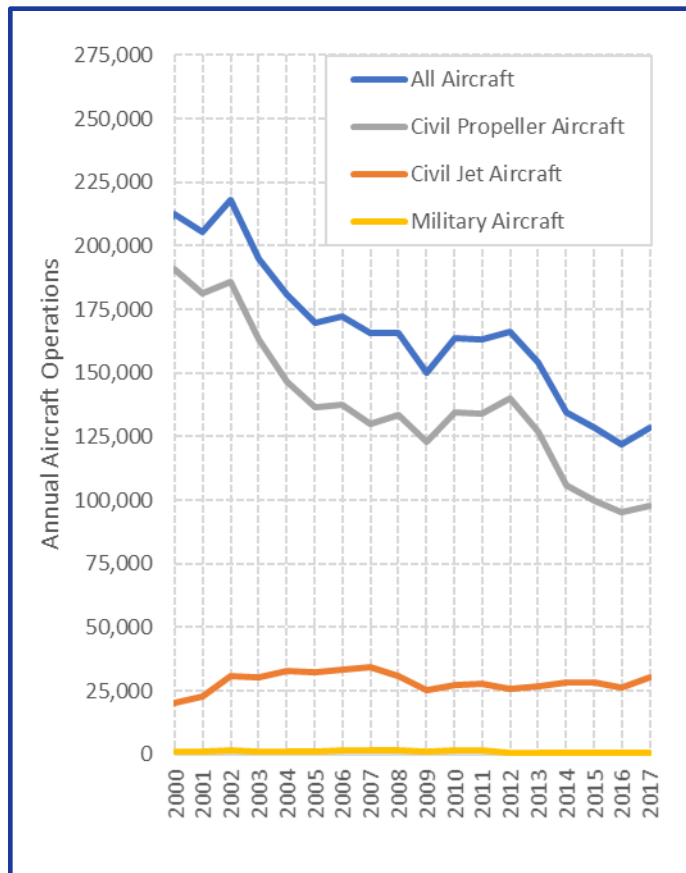
being exposed and re-exposed to the importance and understanding of the quiet-flying techniques (see Section 7.9.7 for additional discussion of the Fly Friendly Program).

The noise analysis for this ESPR utilized the FAA's next-generation airport noise software, the Aviation Environmental Design Tool (AEDT). AEDT combines the FAA's legacy tools for airport noise, emissions, and fuel burn into a single package to ensure consistency across the analyses. The database structure of this new tool allows for the use of a nearly unlimited number of aircraft flight paths and operations to model the full detail of operations at an airport. Several new aircraft types have been added to AEDT relative to the Integrated Noise Model (INM), which was used for the 2012 ESPR, and some noise and performance computation algorithms have been updated. However, the current AEDT aircraft noise and performance database and algorithms are largely the same as the most recent versions of the INM and the change in noise model had little impact on the differences in computed noise levels between 2012 and 2017.

Figure 7-1 Historical Aircraft Operations Trends

Comparison of year 2017 DNL noise contours to 2012 contours shows that overall noise levels have increased somewhat. Though total operations decreased between 2012 and 2017 (see Figure 7-1), operations by jet aircraft and the number of nighttime flights increased. The shape of the 2017 noise contours reflect increased operations on Runway 5/23 due to the closure of Runway 11/29 for repaving during the month of August. Additionally, construction at Boston Logan International Airport in 2017 caused some additional aircraft to operate out of Hanscom Field.

Modeled noise values for 2005 are also included in this section and demonstrate a longer-term trend of decreasing noise. This is largely due to overall lower activity levels and the elimination of activity by Stage 2 GA jets. FAA land use compatibility guidelines generally consider aircraft noise greater than 65 dB DNL to be incompatible with residential and other noise-sensitive land uses. No residential land uses were exposed to a DNL value above the FAA land use



Source: Massport 2017 Hanscom Annual Noise Report

compatibility recommendation of 65 dB in 2017, as the DNL 65 dB contour does not extend beyond Massport property.

With the forecasted level of aircraft operations, noise is anticipated to increase in 2025 over 2017 and then again in 2035. However, noise in 2025 and 2035 is projected to remain lower than what was experienced in 2005.

Table 7-1 presents population estimates within the 65 and 55 DNL contours for 2005, 2012, 2017, and the forecasted 2025 and 2035 scenarios.

Table 7-1 Summary of U.S. Census Population Counts within DNL Contours

Year/Scenario	Population ¹	
	65 dB or Greater ²	55 dB or Greater ³
2000	26	2,848
2005	17	2,953
2012	0	1,041
2017	0	1,271
2025	0	1,675
2035	0	2,047

Notes:

1. Based on the 2010 U.S. Census except for 2000 and 2005 which were computed for the 2000 and 2005 *ESPRs* using the 2000 U.S. Census
2. These population estimates fall within the 65 and 70 DNL contours.
3. These population estimates include population within the 55, 60, 65, and 70 DNL contours

Source: HMMH 2018

In addition to noise contours, the 2017 *ESPR* includes detailed noise results at noise analysis locations throughout the four towns and MMNHP.

- ⇒ No historic sites were within the 60 DNL contour for the 2012 *ESPR* or the 2017 *ESPR*. There are only two historic sites that have DNL values greater than 55 dB in 2017 and noise levels decreased at both sites in 2017 relative to 2012:
 - The Deacon John Wheeler/Capt. Jonas Minot Farmhouse (NC-18) in Concord; and,
 - The Wheeler-Meriam House (NC-19) in Concord.
- ⇒ No noise analysis locations in the four town are predicted to experience a DNL value greater than 60 dB under the 2025 or 2035 scenarios. The Deacon John Wheeler/Capt. Jonas Minot Farmhouse in Concord, the Wheeler-Meriam House in Concord, and Simonds Tavern (NLX-1) in Lexington are the only three sites with a projected DNL of 55 dB or greater in these scenarios.
- ⇒ No portion of the MMNHP is located within the 60 DNL contour in 2017 or in the forecasted 2025 and 2035 planning scenarios. The 2017 and forecast future 55 DNL contours do extend into MMNHP.

- ⇒ One site in MMNHP, Noah Brooks Tavern (MM-13) experienced a DNL of 55 dB in 2017 due to higher than typical use of Runway 5/23 during the closure of Runway 11/29 for repaving. Though the 55 dB DNL contours do extend into the park, no identified noise analysis sites in the MMNHP are projected to experience a DNL value of 55 dB or greater for any future scenario.

7.2 Noise Terminology

Noise, often defined as unwanted sound, is an environmental issue associated with aircraft operations. Aircraft are not the only sources of noise in an urban or suburban environment where interstate and local roadway traffic, rail, industrial, and neighborhood sources intrude on the everyday quality of life. Nevertheless, aircraft are readily identified by their noise and are typically singled out for special attention and criticism. Consequently, aircraft noise often dominates analyses of environmental impacts. To help understand and interpret these impacts, it is important to be familiar with the various metrics that are used to describe the noise from an aircraft and from the collection of noise events that comprise an airport noise environment. This introductory section describes those commonly used noise metrics, in increasing complexity.

The 2017 *ESPR* reports noise levels at Hanscom Field in terms of these metrics, including SELs for typical individual events, and Time Above contours and DNL contours for typical 24-hour exposure periods. All three of these metrics utilize A-weighted Sound Levels as their basic unit of measurement. The 2017 *ESPR* uses the highlighted metrics (i.e., SEL, EXP, and TA) to supplement DNL contours and DNL values at noise analysis locations. Appendix D provides a discussion of the effects of aircraft noise on people.

Commonly used noise metrics include:

- ⇒ Decibel (dB);
- ⇒ A-weighted decibel, or sound level (dBA);
- ⇒ Sound Exposure Level (SEL);
- ⇒ Equivalent Sound Level (Leq);
- ⇒ Day-Night Sound Level (DNL);
- ⇒ Total Noise Exposure (EXP);
- ⇒ Time Above (TA).

7.2.1 The Decibel (dB)

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (e.g., music) or unpleasant (e.g., jackhammer) depends largely on the listener's current activity, experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The loudest sounds the human ear can comfortably hear have one trillion (1,000,000,000,000) times the acoustic energy of sounds the ear can barely detect. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes unwieldy. As a result, a logarithmic unit called the decibel is used to represent the intensity of sound. This representation is called Sound Pressure Level.

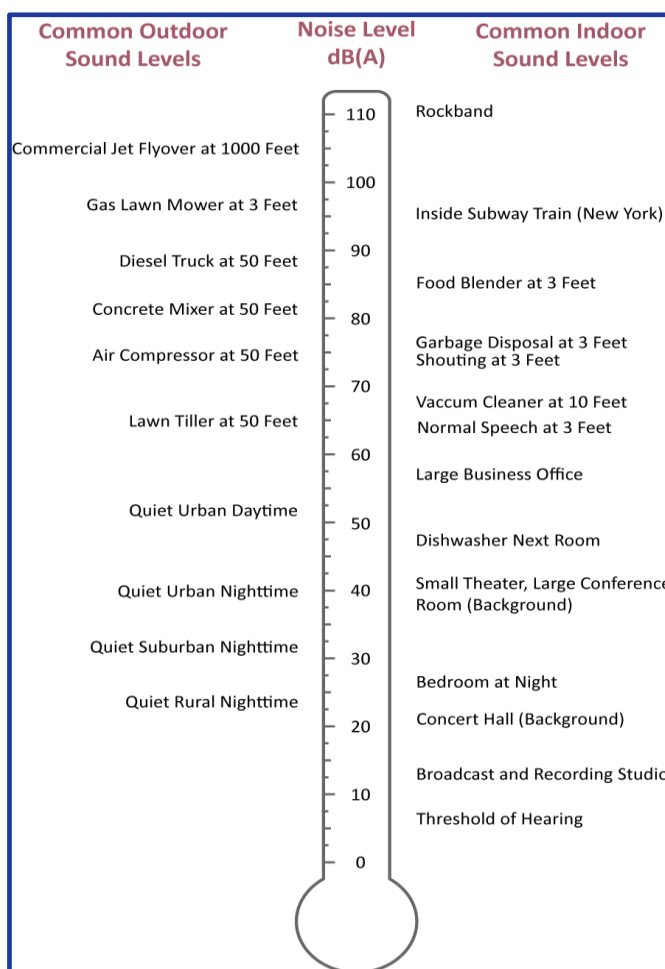
A Sound Pressure Level of less than 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet conditions. Normal conversational speech has a sound pressure level of approximately 60 to 65 dB. Sound pressure levels above 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

7.2.2 A-Weighted Sound Level (dBA)

Additionally, not all sound pressures are heard equally well by the human ear. Some tones are easier to detect than others are, and are perceived as being louder or noisier. Thus, in measuring community noise, frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's reduced sensitivity to those frequencies. This adjustment is called "A-weighting" and is commonly used in measurements of environmental noise.

A-weighted Sound Levels for some common sounds are shown in Figure 7-2. In this document, all Sound Pressure Levels are A-weighted and, as is customary, are referred to simply as "Sound Levels," where the adjective "A-weighted" has been omitted. Sound Levels are designated in terms of A-weighted decibels, abbreviated dBA. With A-weighting, a noise source having a higher Sound Level than another is generally perceived as louder. Also, the minimum change in Sound Level that people can detect outside of a laboratory environment is on the order of 3 dB. A change in Sound Level of 10 dB is usually perceived by

Figure 7-2 Common A-weighted Sound Levels



Source: HMMH, 2016

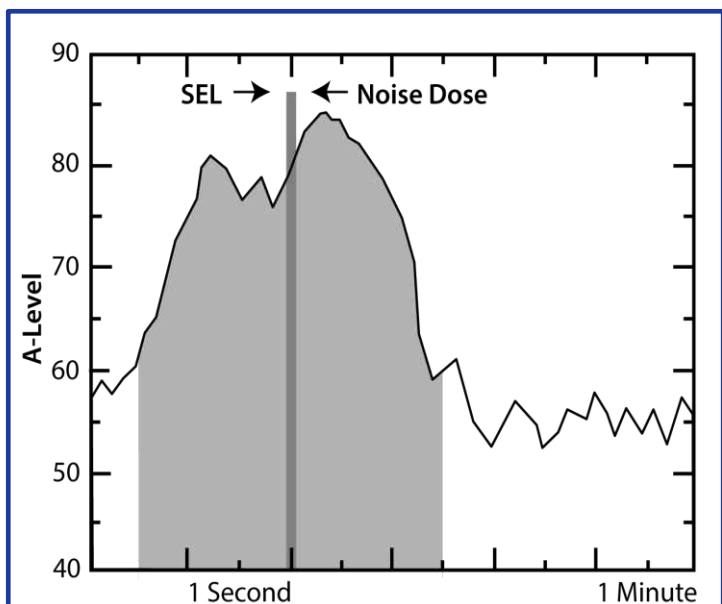
the average person as a doubling (or halving) of the sound's loudness, and this relationship remains so for loud sounds as well as for quieter sounds.

7.2.3 Sound Exposure Level (SEL)

A further complexity in judging the impact of a sound is how long it lasts. Long duration noises are generally more annoying than short ones. The period over which a noise is heard is accounted for in noise measurements and analyses by integrating sound pressures over time. In the case of an individual aircraft flyover, this can be thought of as accounting for the increasing noise of the airplane as it approaches, reaches a maximum, and then falls away to blend into the background (see Figure 7-3). The total noise dose, or exposure, resulting from the time-varying sound is normalized to a one-second duration so that exposures of different durations can be compared on an equal basis. This time-integrated level is known as the Sound Exposure Level, measured in A-weighted decibels.

Because aircraft noise events last longer than one second, the time-integrated SEL always has a value greater in magnitude than the maximum sound level of the event – usually about 7 to 10 dB higher for most airport environments. SELs are used in this study as a means of comparing the noise of several significant aircraft types; they are also correlated with sleep disturbance, an impact that is discussed in Appendix D.

Figure 7-3 Illustration of Sound Exposure Level



Source: HMMH, 2016

The remaining noise metrics discussed in this section refer to the accumulation of exposure caused by multiple noise events over time. While such metrics are often viewed as downplaying the importance of individual aircraft operations, they are extremely good indicators of community annoyance with complex noise environments, and they have become widely accepted as the most appropriate means of evaluating land use planning decisions.

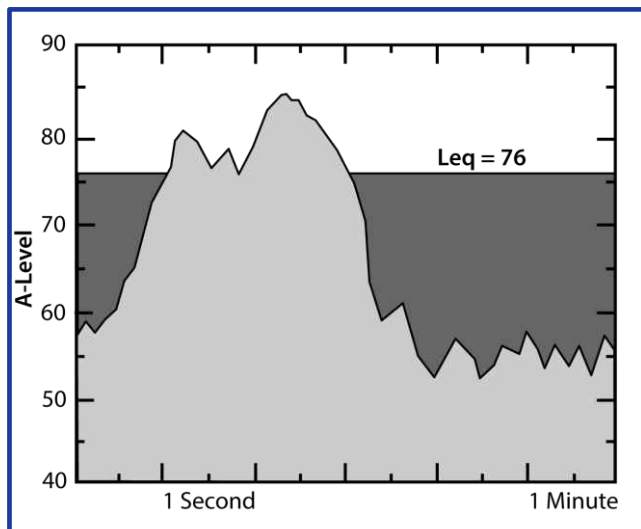
7.2.4 Equivalent Sound Level (Leq)

The most basic measure of cumulative exposure is the Equivalent Sound Level. It is a measure of exposure resulting from the accumulation of A-weighted Sound Levels over a particular period (as opposed to an event) of interest such as an hour, an eight-hour school day,

nighttime, a single 24-hour period, or an average 24-hour period. Because the length of the period can differ, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a notation, for example Leq (8) or Leq (24).

Conceptually, the Leq may be thought of as the constant sound level occurring over the designated period of interest and having as much sound energy as that created by the actual rising and falling sound pressures from multiple noise sources as they become more or less pronounced. This is illustrated in Figure 7-4 for the same representative one-minute of exposure shown earlier in Figure 7-3. Both the dark and light gray shaded areas have a one-minute Leq value of 76 dBA. It is important to recognize, however, that the two representations of exposure (the constant one and the time-varying one) would sound very different from each other were they to occur in real life.

Figure 7-4 Illustration of Equivalent Sound Level



Source: HMMH, 2016

Often the Leq is referred to as an "average" sound level. This can be confusing since a simple average of the Sound Levels over the period will not yield the correct Leq. Because decibels are logarithmic quantities, loud events contain much more sound energy than quieter events and dominate the calculation of the Leq. For example, if an aircraft produced a constant sound level of 85 dBA for 30 seconds of a minute then immediately disappeared, leaving only ambient noise sources to produce a level of 45 dBA for the remaining 30 seconds, the Leq for the full minute would be 82 dBA – just 3 dBA below the maximum caused by the aircraft, not the 65 dBA suggested by normal averaging.

More typical timeframes of interest are daytime, nighttime, and annual average 24-hour exposure levels, but all of these same principles of combining sound levels apply to those periods as well. Loud noise events occurring during any timeframe are going to have the greatest influence on the overall exposure for the period.

7.2.5 The Day-Night Sound Level (DNL)

The most widely used cumulative noise metric is a variant of the 24-hour Leq known as the Day-Night Sound Level, or DNL, a measure of noise exposure that is highly correlated with community annoyance. The long-term (yearly) average DNL is also associated with a variety of FAA land use guidelines that suggest where incompatibilities are expected to exist between the noise environment and various human activities. Because of these strengths, the metric is

required to be used for airport noise studies funded by the FAA. The FAA's recommended guidelines for noise/land use compatibility evaluation, found in 14 CFR Part 150, are based on a compilation of extensive scientific research and state that DNL values of 65 dB and lower are compatible with all land uses including residential land use.

In simple terms, DNL is the Leq for a 24-hour period, modified so that noises occurring at night (defined specifically as 10:00 PM to 7:00 AM) are artificially increased by 10 dB. This "penalty" reflects the added intrusiveness of nighttime noise events as community activity subsides and ambient noise levels get quieter. The penalty is mathematically equivalent to multiplying the number of nighttime noise events by a factor of ten.

The U.S. Environmental Protection Agency (EPA) identified DNL as the most appropriate means of evaluating airport noise based on its criteria, as follows:⁹¹

- ⇒ The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods of time.
- ⇒ The measure should correlate well with known effects of the noise environment and on individuals and the public.
- ⇒ The measure should be simple, practical and accurate. In principal, it should be useful for planning as well as for enforcement or monitoring purposes.
- ⇒ The required measurement equipment, with standard characteristics, should be commercially available.
- ⇒ The measure should be closely related to existing methods currently in use.
- ⇒ The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.
- ⇒ The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods of time.

Despite DNL meeting these criteria, the lay public often criticizes the use of DNL as an inaccurate representation of community annoyance and land use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the measurement or calculation of DNL. One frequent criticism is based on the feeling that people react more to single noise events than to "meaningless" time-average sound levels. In fact, DNL takes into account both the noise levels of all individual events occurring during a 24-hour period and the number of times those events occur. The logarithmic nature of the decibel causes noise levels of the loudest events to control the 24-hour average, just as they were shown to do in the previous discussion of shorter-term Leqs.

Most federal agencies dealing with noise have formally adopted DNL, though they also encourage the use of supplemental noise metrics to aid the public in understanding the complex noise environment of an airport. For example, Massport frequently uses the SEL,

⁹¹ U.S. Environmental Protection Agency. September 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, U.S EPA Report No. 550/9-74-004.

Maximum Sound Level, or Time Above threshold sound levels to help describe the environments around Hanscom Field and Logan International Airport.

Even so, the Federal Interagency Committee on Noise (FICON), comprising of member agencies such as the FAA, Department of Defense (DoD), U.S. EPA, Department of Housing and Urban Development (HUD), National Aeronautics and Space Administration (NASA), Council on Environmental Quality (CEQ), and the Department of Veterans Affairs, reaffirmed the appropriateness of DNL in 1992. The FICON summary report stated, "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric".⁹² The Federal Interagency Committee on Aviation Noise (FICAN) more recently supported the use of supplemental metrics in its statement that "supplemental metrics provide valuable information that is not easily captured by DNL".⁹³

DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for a relatively limited number of points, and, except in the case of a permanently installed noise monitoring system, only for relatively short time periods. The vast majority of airport noise studies are based on computer-generated DNL estimates, depicted in terms of equal-exposure noise contours, much as topographic maps have contours of equal elevation.

7.2.6 Total Noise Exposure (EXP)

The EXP metric was developed in 1982 as a screening tool for Massport to assess changes in the fleet mix of aircraft operating at Hanscom Field over time. Although EXP does not show how noise levels change in specific communities, it does indicate changes in total noise exposure and expected resultant changes in DNL, without the need to prepare noise contours. The 2017 EXP uses the FAA aircraft noise database from the most recent version of the AEDT, Version 2d. This is an upgrade over INM 7.0c, which had been used to compute EXP since the 2012 *ESPR*.

EXP is calculated by logarithmically summing the representative SELs for each departure of an airplane assuming it flies over a single point on the ground. EXP uses the same summation formula as DNL: logarithmic summation of all noise events over a 24-hour day, with a 10 dB penalty applied to events occurring between 10:00 PM and 7:00 AM. Similar aircraft types are grouped together in the calculations, creating a "partial EXP" for the group. Partial EXP values for each group are then summed to obtain a single number estimate of departure noise exposure at that reference location. Separate computations are performed for civil and military operations. Similar calculations are performed for arrival operations.

Historically, departure noise has been the largest contributor to the DNL contours and Massport has used civil departure EXP as the annual tracking metric for changes in noise

⁹² Federal Interagency Committee on Noise. August 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*.

⁹³ Federal Interagency Committee on Aviation Noise. February 2002. *The Use of Supplemental Noise Metrics in Aircraft Noise Analyses*.

exposure at Hanscom Field. Over time, aircraft manufacturers have made significant decreases in aircraft engine noise and thus departure noise levels. Arrival noise has not decreased at the same rate due to its lower proportion of engine noise and higher proportion of airframe noise from deployed flaps, slats, and landing gear. The increased relative importance of arrival noise means that changes in EXP may not align with changes in DNL contours in areas where arrivals provide a large share of the total aircraft noise.

7.2.7 Time Above a Threshold (TA)

Because analyses of decibels are complex and often unfamiliar to the public, the FAA has developed a supplemental noise metric that is non-logarithmic: the amount of time (in minutes or seconds) that the noise source of interest exceeds a given A-weighted Sound Level threshold. Every time a noise event goes above a given threshold, the number of seconds is accumulated and added to any previous periods that the noise exceeded the threshold. These time-above-thresholds, or Time Above, are usually reported for a 24-hour period.

Note that Time Above does not tell the loudness of the various noise events. Just as a single value of the A-weighted Sound Level ignores the dimension of time, so the Time Above ignores the dimension of loudness. Nevertheless, Time Above can be helpful in better understanding a noise environment.

This section documents the noise prediction methodology for preparing the DNL and Time Above calculations for the *2017 ESPR* and discusses changes in the AEDT. The AEDT is a complex computer program that calculates aircraft noise levels around an airport from user input data and an extensive internal database of aircraft noise and performance statistics. Outputs can include DNL and Time Above in the form of contours and values at specific points.

7.3 Noise Prediction Methodology

The FAA developed the AEDT as the primary tool for analyzing and evaluating noise impacts from aircraft operations. Its use is prescribed for all FAA-sponsored projects requiring environmental evaluation. The AEDT contains a set of noise and profile databases, which can be altered by the analyst to enable input of data for new aircraft and engine types, and account for specific changes in flight procedures. The FAA requires that any changes to these databases be approved prior to use on any FAA-related project.

The AEDT interprets all inputs and computes the noise exposure around an airport as a grid of values for many different metrics including the DNL. The grid information is the input for the development of noise contours. This study used the most recent version of the AEDT at the time of analysis, Version 2d (AEDT 2d).

7.3.1 Physical Input

The first two categories of AEDT input, airport layout and flight tracks, are categorized as the physical input. They determine the paths on the runways and in the air where the aircraft travel in the noise model.

Airfield Geometry

The layout of an airfield is an important modeling input. Accurate runway information places modeled flights in the correct locations. Elevation data allow the AEDT to calculate runway gradients, which influence modeled take-off roll distances. The runway end locations, elevations, displaced thresholds and the location and elevation of the airport reference point were taken from the FAA's Form 5010 airport data system. The Form 5010 data do not contain a helipad nor does Hanscom Field have a designated helipad, though helicopters operate at Hanscom Field. The location of a representative helipad was chosen through the examination of helicopter radar tracks, aerial photographs, and the FAA airport diagram. This is discussed in the section on runway use.

The preparation of airport noise exposure contours requires compilation of several categories of information about the operation of an airport, including:

- ⇒ Airfield Geometry – Location, length, orientation, elevation, and thresholds of all runways;
- ⇒ Flight Tracks – Paths followed by aircraft departing from, or arriving to, each runway;
- ⇒ Runway Use – Percentage of operations by each type of aircraft that occur on each runway;
- ⇒ Flight Track Usage – Percentage of operations by each aircraft type that use each flight track;
- ⇒ Operations Numbers – Number of departures, arrivals, and pattern operations by type of aircraft during the year;
- ⇒ Aircraft Noise and Performance – Specific noise and performance data is required for each aircraft.

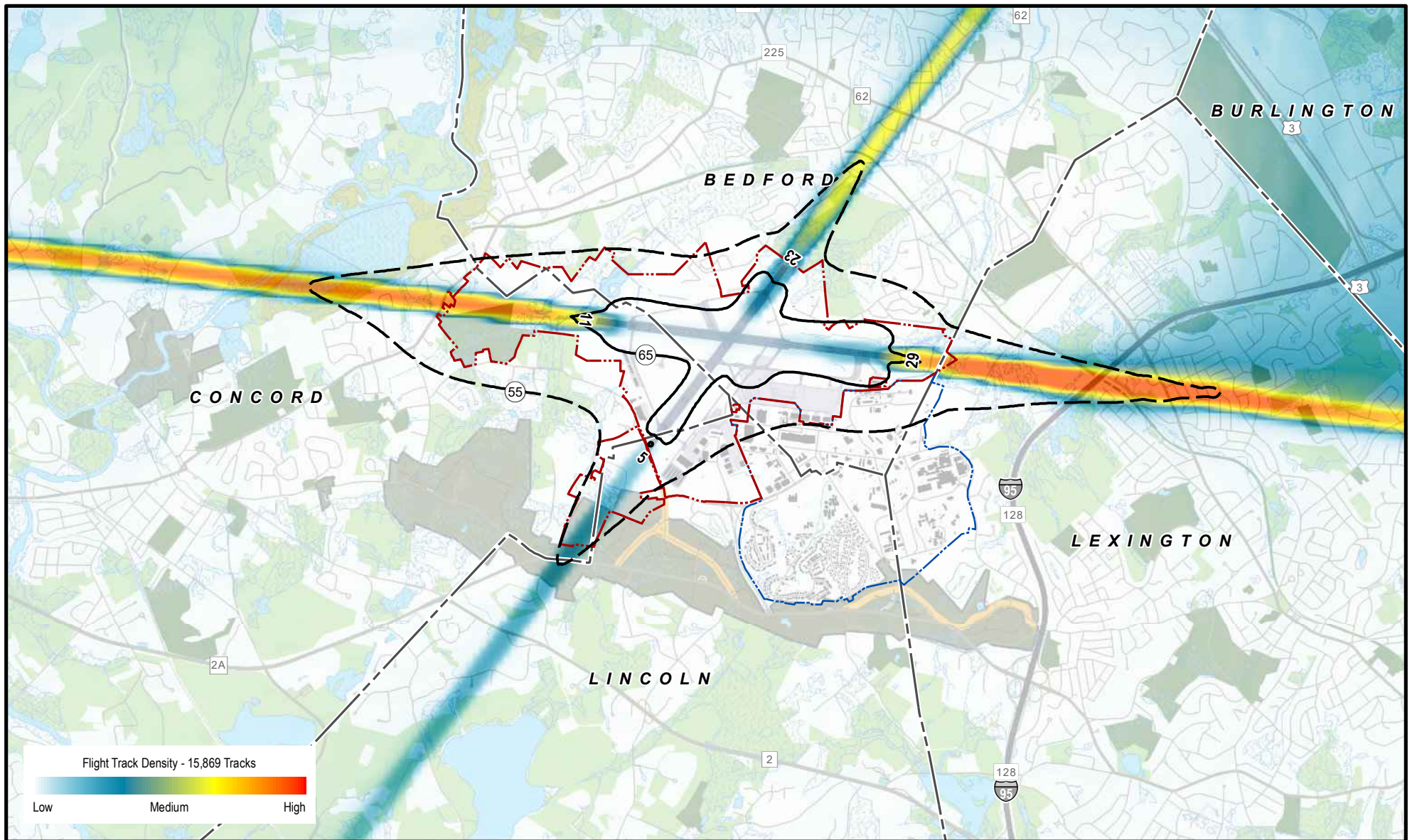
Flight Tracks

Flight tracks represent the ground projection of paths flown by aircraft to and from an airport. Prior to the 2012 *ESPR*, the very broad range of operations and conditions actually occurring at Hanscom Field were represented using a set of average or model tracks. Starting with the 2012 *ESPR*, individual flight tracks from Massport's NOMS were used. HMMH prepared the 2017, 2025, and 2035 contours using an AEDT pre-processor, named RealContours for AEDT™. RealContours for AEDT converts aircraft flight track data into FAA's AEDT input data, runs the AEDT, and provides the AEDT results based on the modeling of each individual flight track.

Flight tracks were provided from Massport's NOMS. In total, 52,335 individual flight tracks were directly used for the preparation of the 2017 contours; these operations were scaled to the 130,679 total actual operations (128,777 daytime and 1,902 nighttime operations). The difference between the number of flight tracks modeled and the total operations counts are expected, and can occur because RealContours for AEDT filters data to make sure it is suitable for modeling. Each flight track must meet several criteria, including having a runway assignment, valid aircraft type designator and enough suitable flight track points. The most important of these factors at Hanscom Field is the presence of a valid aircraft type designator. Operations by piston aircraft are often unidentified in the radar data. Over 40,000 local and over 30,000 itinerant operations were conducted by piston aircraft at Hanscom Field in 2017. The approximately 12,000 valid radar tracks modeled in the ESPR for these aircraft represent an excellent sample showing the distribution of flight paths off all runway ends.

It should be emphasized that the AEDT is used for all noise calculations. RealContours for AEDT provides an efficient method for creating AEDT input for the large volume of individual flight tracks modeled in the ESPR.

Figure 7-5 and Figure 7-6 present density plots for jet arrivals and departures in and out of Hanscom Field. Areas of red represent the highest density of flight paths. Areas of blue show the lowest density. Figure 7-7 and Figure 7-8 are arrival and departure density plots for propeller aircraft, including piston propeller aircraft, turbo-propeller aircraft, and helicopters. Figure 7-9 shows the density of tracks for local activity (tracks that both depart and arrive at Hanscom Field) by light propeller aircraft. Appendix D provides additional flight track graphics, showing samples of the individual flight paths for jet aircraft arrivals and departures, propeller aircraft arrivals and departures, and local tracks by propeller aircraft.



Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

- 2017 - 65 dB DNL Contour
- 2017 - 55 dB DNL Contour
- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

Note: 55 dB DNL contour included to show the effect of flight track distribution on the noise contours.

- Historic Road
- Interstate
- Highway
- Road
- Trail

- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water / Wetland
- Stream

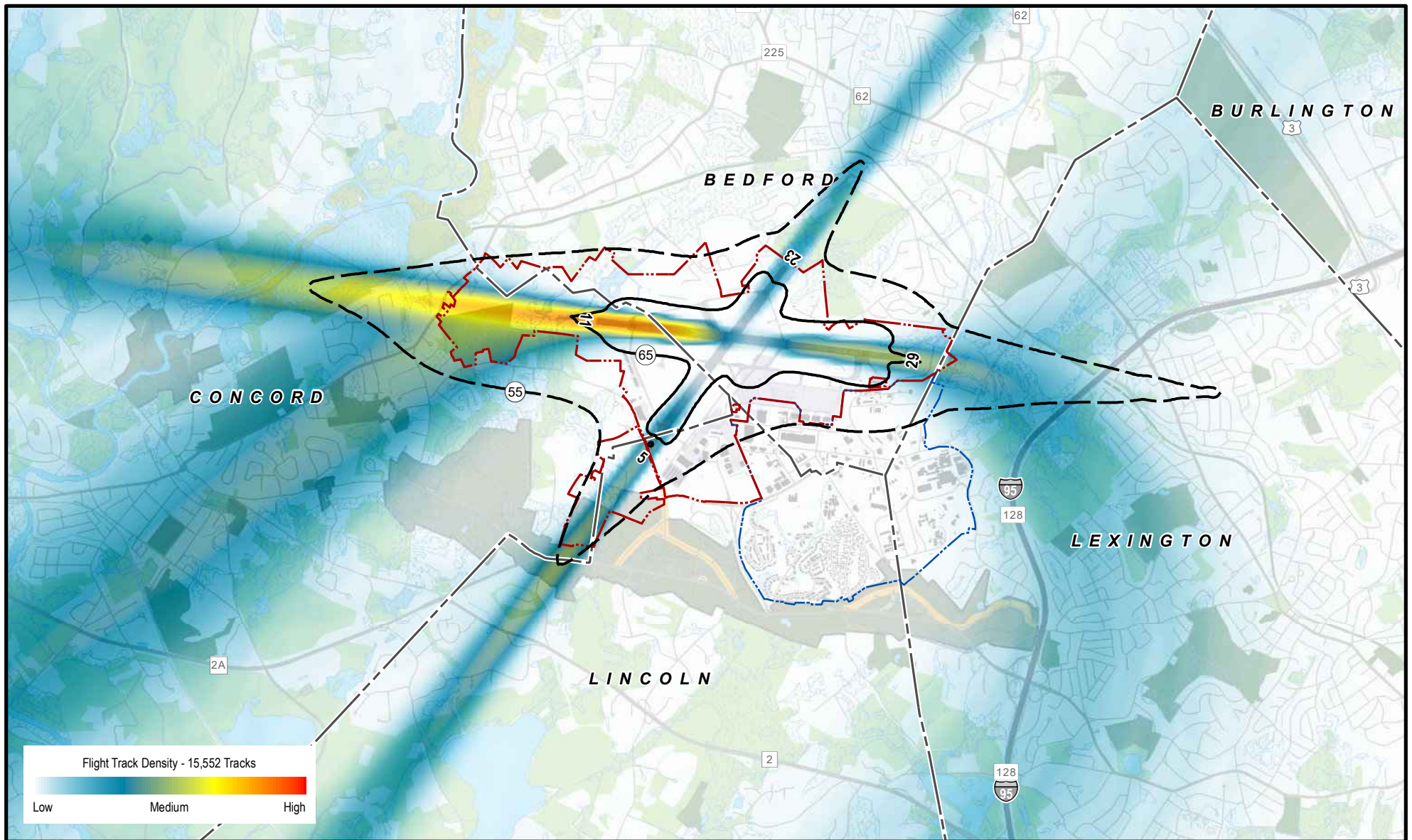


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Turbojet Radar Track Density Plot - Arrivals

Figure 7-5



Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

- 2017 - 65 dB DNL Contour
- 2017 - 55 dB DNL Contour
- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- Trail

- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water / Wetland
- Stream

Note: 55 dB DNL contour included to show the effect of flight track distribution on the noise contours.

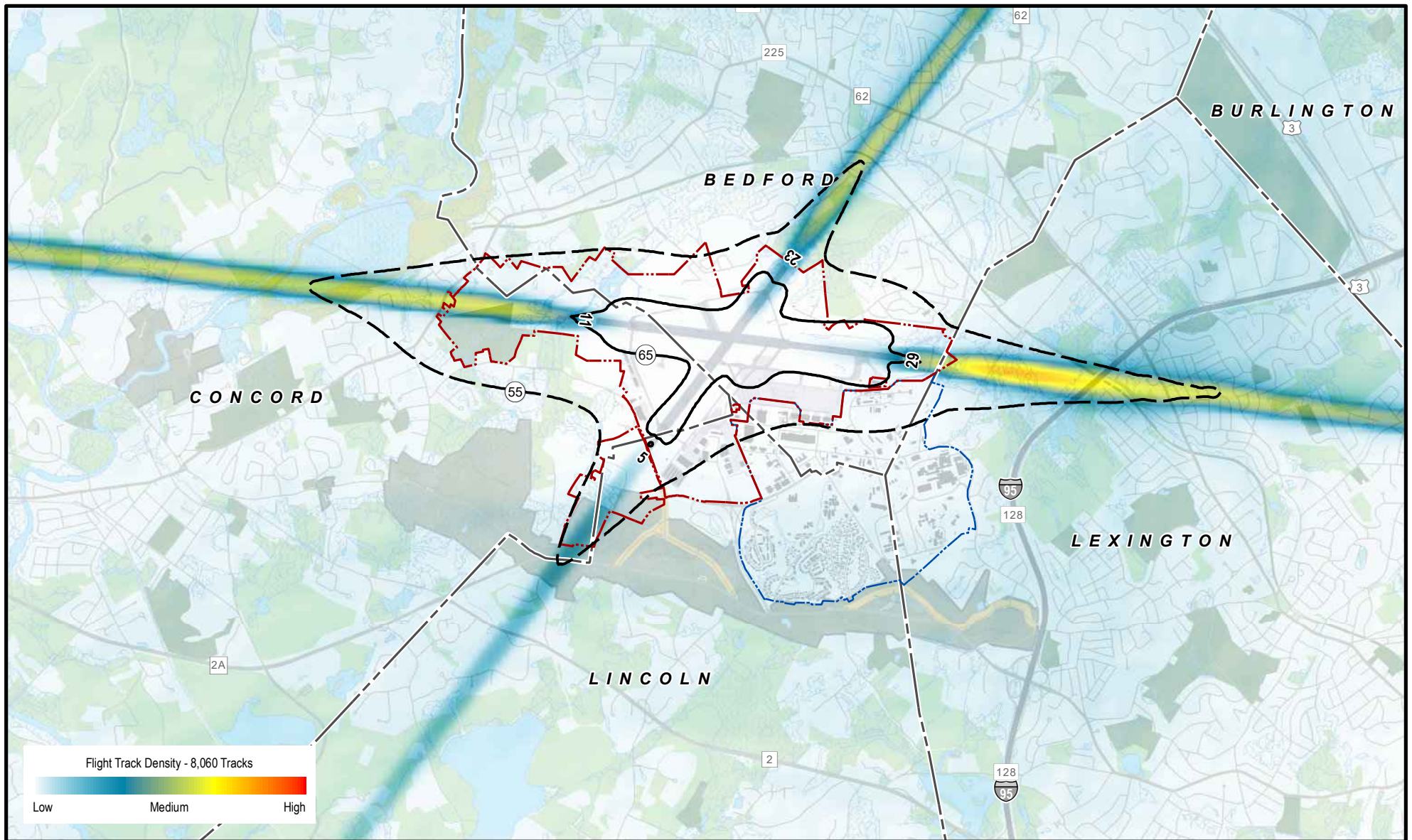


L. G. Hanscom Field

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Turbojet Radar Track Density Plot - Departures

Figure 7-6



- 2017 - 65 dB DNL Contour
- 2017 - 55 dB DNL Contour
- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- Trail

- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water / Wetland
- Stream



L. G. Hanscom Field

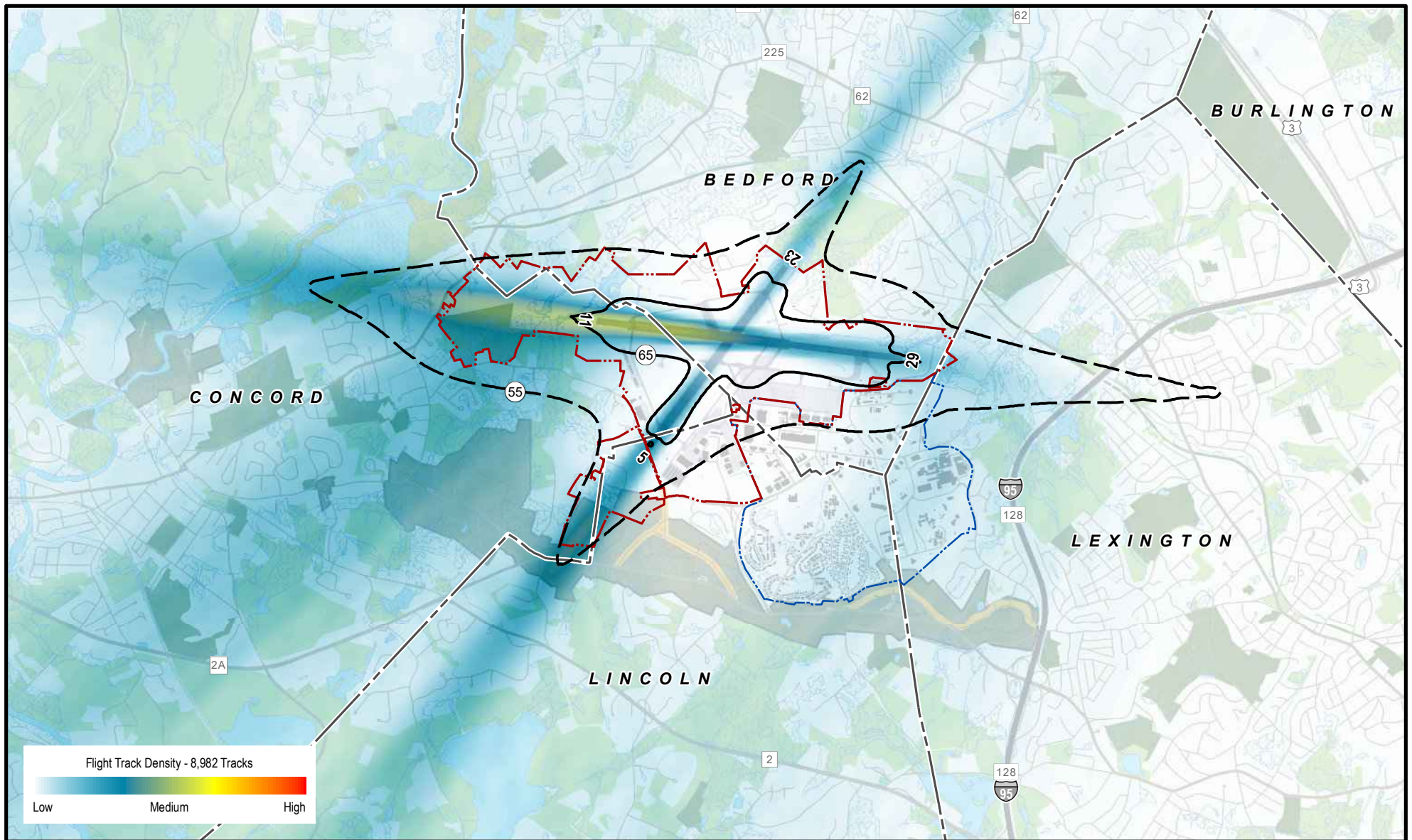
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Propeller Aircraft Radar Track Density Plot - Arrivals

Note: 55 dB DNL contour included to show the effect of flight track distribution on the noise contours.

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure 7-7



- 2017 - 65 dB DNL Contour
- 2017 - 55 dB DNL Contour
- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- Trail

- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water / Wetland
- Stream



L. G. Hanscom Field

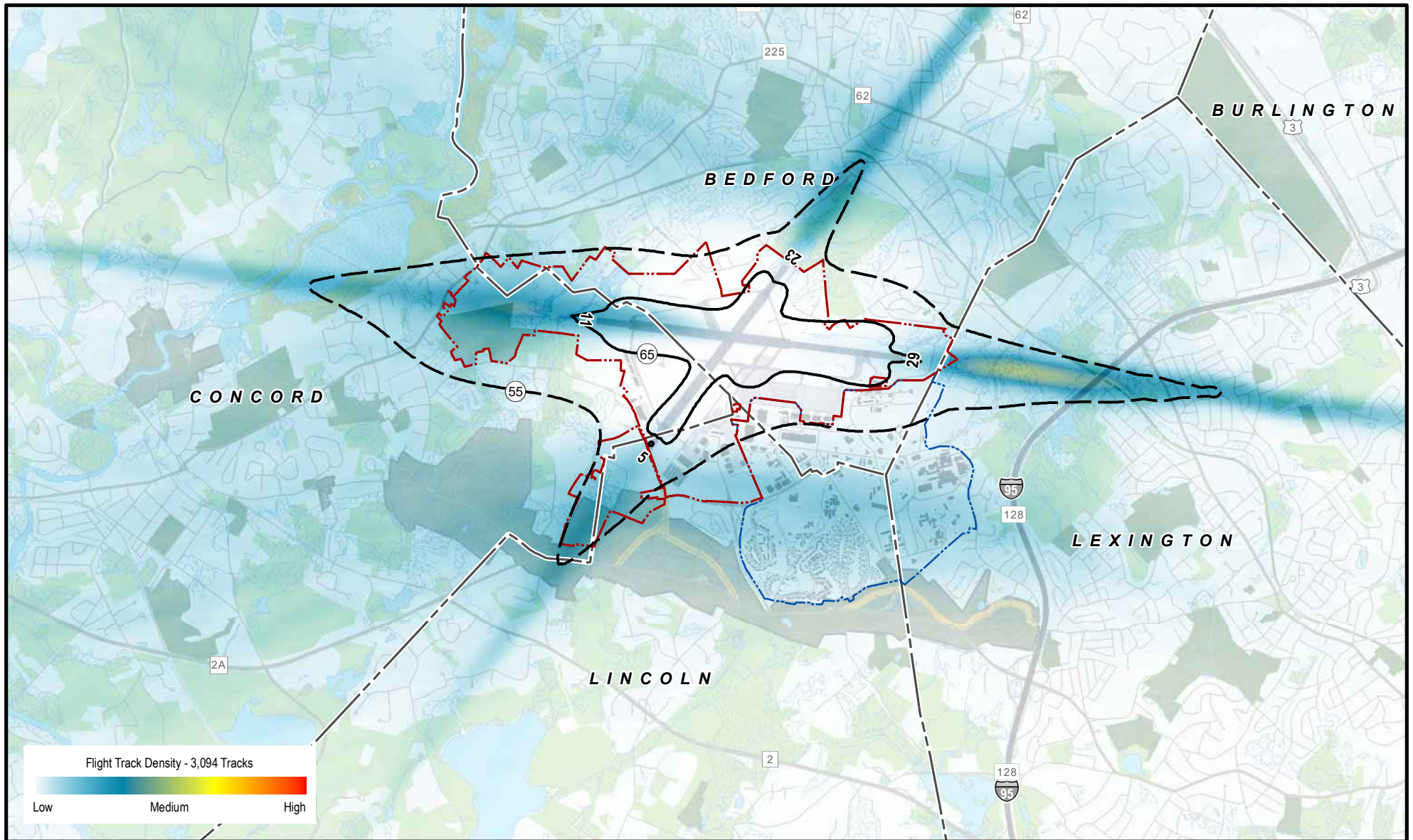
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Propeller Aircraft Radar Track Density Plot - Departures

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Note: 55 dB DNL contour included to show the effect of flight track distribution on the noise contours.

Figure 7-8



- 2017 - 65 dB DNL Contour
- 2017 - 55 dB DNL Contour
- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- Trail

- MMNHP Boundary
- Great Meadows
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water / Wetland
- Stream



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Propeller Aircraft Radar Track Density Plot - Local

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Note: 55 dB DNL contour included to show the effect of flight track distribution on the noise contours.

Figure 7-9

7.3.2 Operational Input

The remaining AEDT input falls under the category of operational input and includes runway use, operations, and aircraft noise and performance data. These data determine the number, type, flight time, and other characteristics of the aircraft traveling on the paths defined in the physical input.

Runway Use

The operational runway use of the airport is a critical component in the computer modeling of aircraft noise. As described in above, all valid individual flight tracks from Massport's NOMS for the entire year of 2017 were used in the noise modeling. This large sample of over 50,000 flight tracks provides an excellent estimate of runway use for 2017 at Hanscom Field. For reporting purposes, each flight track was assigned to a category based on the type of propulsion and size of the aircraft. Once in these categories, the data were used to calculate runway use percentages.

Table 7-2 through Table 7-6 show the calculated runway use by operation and aircraft group. Helicopter runway use is not included in these tables. Table 7-6, Touch and Go Runway Utilization, is not differentiated by aircraft group as all pattern activity was modeled using piston aircraft. The 2017 runway use below reflects the closure of Runway 11/29 for repaving during the month of August. This main result of this closure was an increase in the annual use of Runway 5/23 and a decrease in the use of Runway 11/29 as compared to 2012.

Many of the helicopters in the radar sample followed runway headings on arrival and dispersed quickly off the runway centerline after departure, similar to light propeller aircraft. However, with their maneuverability, helicopters often hover along taxiways and depart or land from ramp areas as well as runway ends, and no hard data on arrival and departure locations on the airfield are maintained, by Massport or the FAA. To simplify the modeling of these conditions, helicopter operations were assumed to originate or terminate at a single point just north of the control tower. The radar flight track defined the remainder of the modeled flight path, the portion that determines the noise exposure away from the center of the airport.

Table 7-2 Daytime (7:00 AM to 10:00 PM) Departure Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	4.9%	0.5%	7.9%	7.3%
11	23.0%	32.8%	21.0%	15.4%
23	12.1%	1.0%	16.9%	20.3%
29	60.0%	65.7%	54.2%	57.0%
Total	100.0%	100.0%	100.0%	100.0%

Source: Massport Noise and Operations Monitoring System flight tracks, 2017

Table 7-3 Nighttime (10:00 PM to 7:00 AM) Departure Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	11.7%	0.0%	22.7%	15.8%
11	19.9%	17.7%	17.1%	11.4%
23	5.7%	0.0%	11.9%	37.7%
29	62.6%	82.3%	48.3%	35.2%
Total	100.0%	100.0%	100.0%	100.0%

Source: Massport Noise and Operations Monitoring System flight tracks, 2017

Table 7-4 Daytime (7:00 AM to 10:00 PM) Arrival Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	3.2%	0.0%	4.5%	5.4%
11	27.3%	35.7%	25.0%	20.6%
23	14.3%	0.7%	20.6%	22.4%
29	55.3%	63.6%	49.9%	51.7%
Total	100.0%	100.0%	100.0%	100.0%

Source: Massport Noise and Operations Monitoring System flight tracks, 2017

Table 7-5 Nighttime (10:00 PM to 7:00 AM) Arrival Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	1.8%	0.0%	4.8%	4.9%
11	39.6%	38.7%	34.4%	24.0%
23	10.7%	0.0%	22.8%	35.8%
29	48.0%	61.3%	38.0%	35.4%
Total	100.0%	100.0%	100.0%	100.0%
Source: Massport Noise and Operations Monitoring System flight tracks, 2017				

Table 7-6 Touch-and-Go Runway Utilization

Runway	Daytime (7:00 AM to 10:00 PM)	Nighttime ¹ (10:00 PM to 11:00 PM)
05	9.8%	0.0%
11	12.4%	18.8%
23	18.1%	0.0%
29	59.7%	81.3%
Total²	100.0%	100.0%
Note: 1. Touch-and-go operations are not allowed from 11:00 PM to 7:00 AM 2. Aircraft other than single engine pistons are not allowed to perform touch-and-go operations. Source: Massport Noise and Operations Monitoring System flight tracks, 2017		

Operations

Massport's database of operations at Hanscom Field described in the EXP section, Section 7.6.4 provided the information necessary for the calculation of the average daily operations by aircraft type for 2017. Table 7-7 presents a summary of the 2017 operations modeled for the noise analysis. Appendix D provides a refined breakdown of the activity by individual aircraft types with their corresponding noise model representation.

Table 7-7 Year 2017 Average Daily Operations Summary by Group

Group	Departures		Arrivals		Total
	Daytime (7:00 AM to 10:00 PM)	Nighttime (10:00 PM to 7:00 AM)	Daytime (7:00 AM to 10:00 PM)	Nighttime (10:00 PM to 7:00 AM)	
Jets	40.5	2.4	39.4	3.5	85.8
Turboprops	10.6	0.3	10.5	0.4	21.8
Piston	112.4	0.2	112.2	0.3	225.1
Military	1.1	0.0	1.0	0.0	2.1
Helicopters	11.3	0.3	11.1	0.5	23.2
All Groups	175.9	3.1	174.3	4.7	358.0

Source: Massport EXP System, HMMH 2018

Aircraft Noise and Performance Data

Specific noise and performance data are necessary to model each aircraft type. The AEDT database contains noise data in the form of SELs at a range of distances (from 200 feet to 25,000 feet) from a particular aircraft with engines at a specific thrust level. Performance data in the AEDT database include thrust, speed, and altitude profiles for takeoff and landing operations. The AEDT database contains standard noise and performance data for over 300 different fixed wing aircraft and rotorcraft types, most of which are civil aircraft. The AEDT has over 5,000 airframe and engine combinations that are specifically defined in the AEDT database to use these noise and performance data.

The program automatically accesses the applicable noise and performance data for departure and approach operations by those aircraft. For aircraft not included in the database, aircraft with incomplete information in the database, or aircraft using non-standard flight profiles, the data must be manually entered into the model. Due to the large number of airframe and engine combinations in the AEDT standard database, there was no need to include any such non-standard aircraft data in this study.

7.3.3 Noise Model Differences

For this 2017 *ESPR*, Massport has transitioned from using FAA's legacy modeling software, INM, to FAA's next generation software, AEDT. AEDT is the required model for noise studies seeking FAA approval. While the Massachusetts Environmental Policy Act (MEPA) *ESPR* process does not require FAA approval, Massport performed the analyses to FAA standards. All noise calculations in the 2017 *ESPR* were prepared with AEDT 2d, which was the most current version available at the time of the analysis. The 2012 *ESPR* calculations used INM 7.0c.

The EXP for 2017 was computed in both INM 7.0c and AEDT 2d to aid in comparing current and future calculations of EXP to past values. Civil Departure EXP, used to track trends in total noise exposure at Hanscom Field, was 106.8 dB for INM 7.0c and 106.7 dB for AEDT 2d. This minimal difference reflects the fact that though AEDT has added some new aircraft types and updated some aircraft noise and performance calculations, the database and algorithms remain very similar to those used in INM.

Thirty-nine of the EXP aircraft groups had changes to their SELs plus or minus 1.0 dB or less. Four aircraft groups had changes ranging from minus 5 dB to plus 4 dB due to changing the AEDT aircraft, which represents the group. One aircraft group that with an aircraft code that could represent either a Stage 2 or Stage 3 aircraft decreased in SEL by 16 dB due to using a Stage 3 aircraft to replace the former Stage 2 aircraft representing the group. These changes were primarily due to recent updates in the FAA recommended aircraft in AEDT. Additionally, four new EXP groups, all jets, were added.

7.4 Year 2017 Noise Levels

This section describes current (year 2017) noise levels at Hanscom Field. Figure 7-10 depicts noise exposure levels in terms of DNL contours resulting from 2017 operations at Hanscom Field. The figure shows contour values from 55 to 70 dB in 5 dB increments. DNL contours are a graphical representation of how the noise from Hanscom Field's aircraft operations is distributed over the surrounding area on an average day of a given year. The 2012 *ESPR* DNL contours are included in Figure 7-10 for comparison.

Table 7-8 presents the acreage within each contour for 2000, 2005, 2012, and 2017 and indicates a general increase in the size of the 2017 contours as compared with the 2012 contours and a decrease relative to the 2000 and 2005 contours. The size and shape of the contours also shows the effect of the August 2017 temporary closure of Runway 11/29 with the increase in the contour lobes associated with Runway 5/23 operations and the effects of increased traffic due to diversions from Boston Logan due to construction.

Table 7-8 Area within Year 2017 DNL Contours

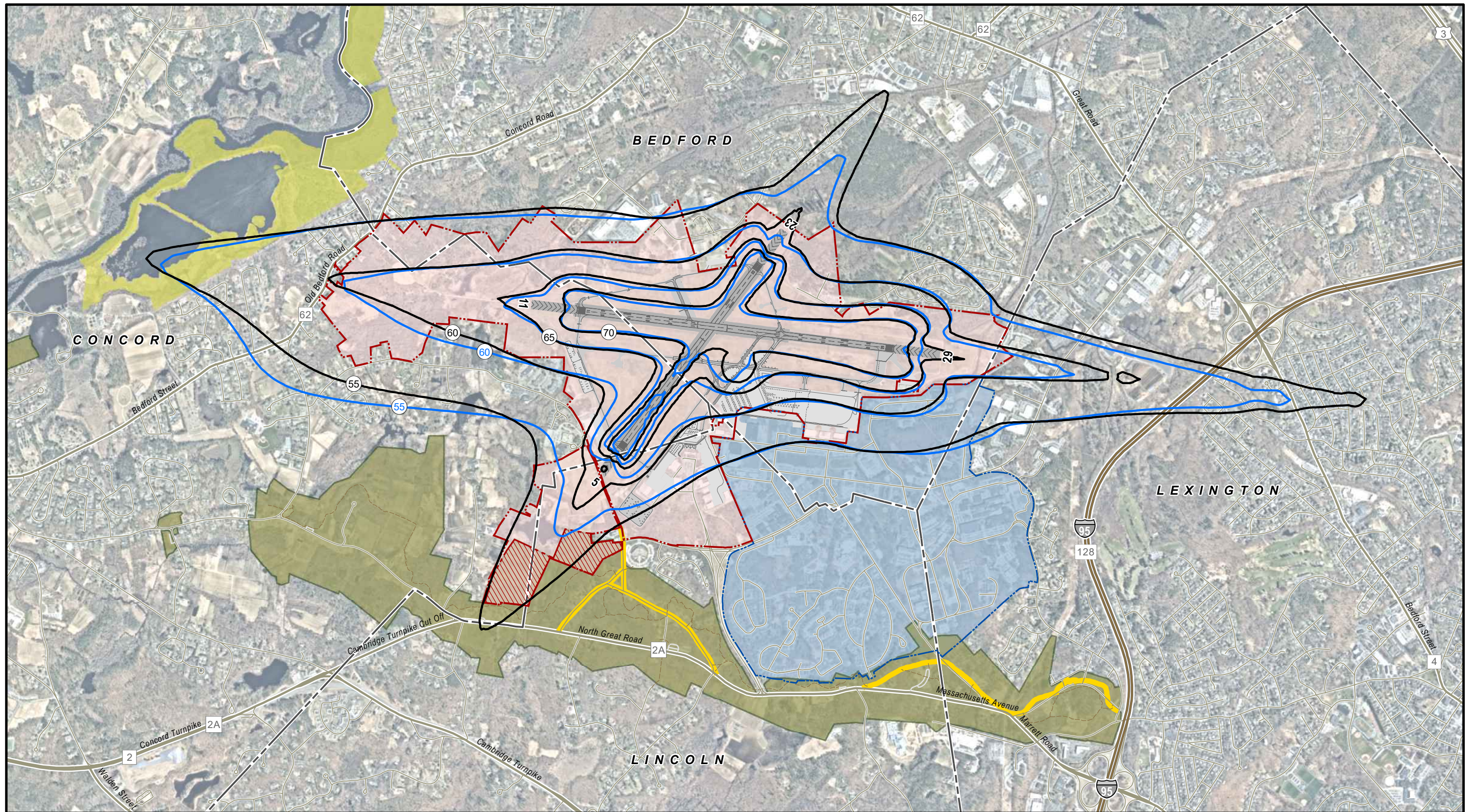
DNL Contours (dB)	Cumulative Area ¹ (Acres)			
	2000	2005	2012 ²	2017
70	334	311	181	216
65	688	635	391	423
60	1,550	1,437	856	909
55	3,480	3,291	2,045	2,227

Note:
 1. Area within contour includes all greater DNL values.
 2. All areas within 65 DNL contour in 2012 and 2017 are contained within Hanscom Field boundaries.
 Source: HMMH 2018.

7.4.1 Comparison of Year 2017 Contours with 2012 Contours

The differences between the Year 2017 contours and the Year 2012 contours are influenced by a number of factors, as discussed below:

- ⇒ The number of total operations decreased by 21 percent in 2017 relative to 2012.
- ⇒ Daily jet operations increased by 28 percent in 2017 relative to 2012.
- ⇒ The phase out of civil Stage 2 jet operations in 2015 eliminated civil Stage 2 jet operations in 2017 from less than one percent of civil jet operations in 2012.
- ⇒ The number of average daily nighttime operations (between 10 PM and 7:00 AM) increased by 26 percent from 2012 to 2017.
- ⇒ The size and shape of the contours shows the effect of the August 2017 temporary closure of Runway 11/29 with the increase in the contour lobes associated with Runway 5/23 operations, and increases due to flights diverted from Boston Logan due to construction.



- | | | | | | |
|--|---|--|--------------------|--|---------------|
| | 2017 DNL Noise Contour | | Municipal Boundary | | Historic Road |
| | 2012 DNL Noise Contour | | MMNHP Boundary | | Interstate |
| | Hanscom Field Property Boundary | | Great Meadows | | Highway |
| | Massport Property within MMNHP Congressional Boundary | | | | Road |
| | Hanscom AFB Property Boundary | | | | Trail |



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2012 and 2017 DNL Noise Contour Comparison

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018

Figure 7-10



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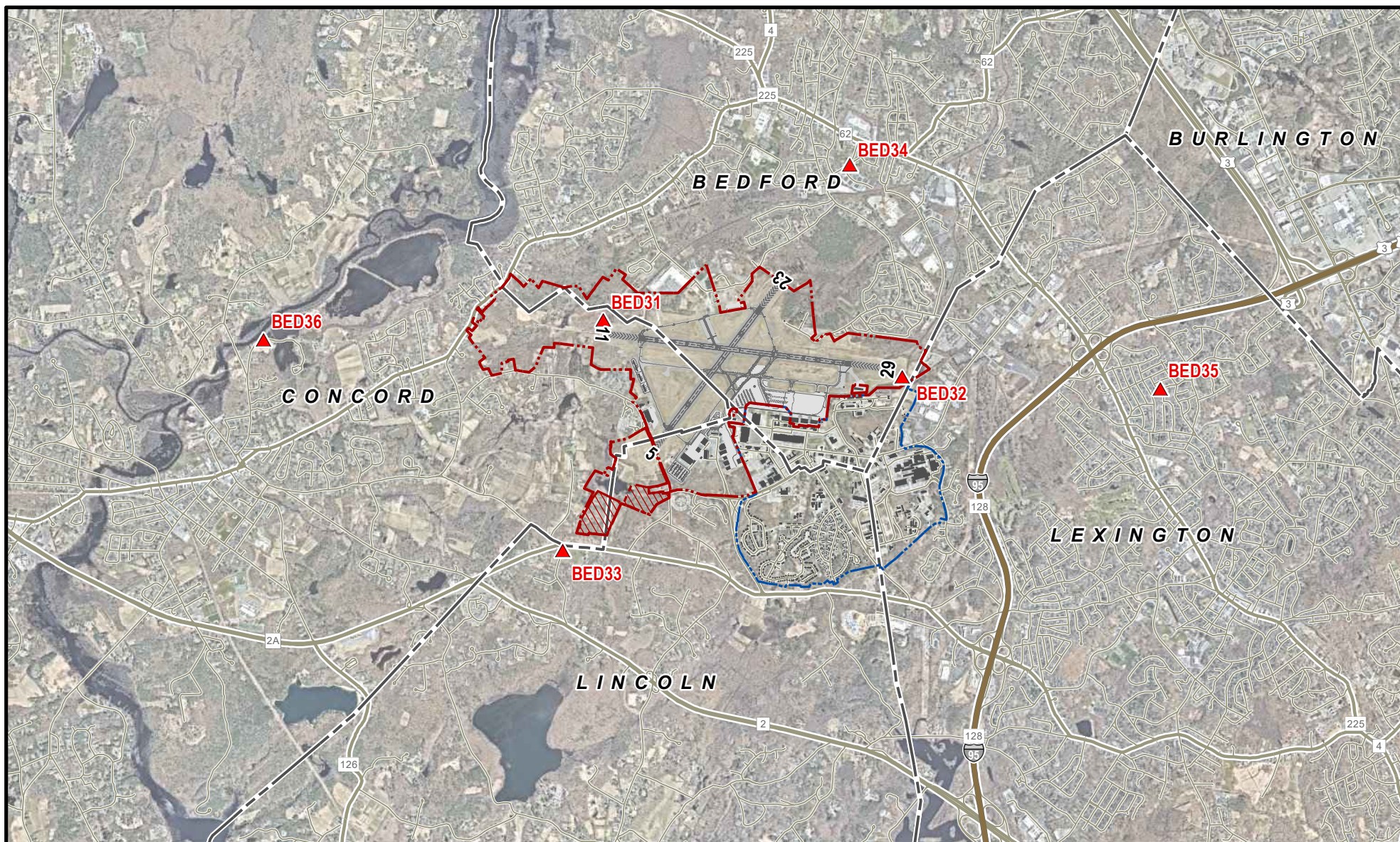
7.4.2 Measured vs. Modeled Noise Levels

Hanscom Field has a system of six permanent noise monitors (see Figure 7-11). Table 7-9 presents the minimum, the mean, and the maximum total DNL values including all aircraft and ambient noise as measured at each of these locations in 2017, as well as the modeled value at each point for aircraft only.

Table 7-9 Measured and Modeled DNL Values (in dB) at Permanent Monitoring Locations

Site Number	Location	Measured Noise (Aircraft and Ambient Sources)			Modeled Aircraft Noise (Aircraft Only)	Measured Minus Modeled
		Minimum	Mean	Maximum		
31	Concord Localizer ¹	55.2	68.9	88.1	60.5	8.4
32	Bedford Localizer	53.4	62.8	73.8	61.2	1.6
33	Lincoln Brooks Road	48.6	56.5	67.3	54.2	2.3
34	Bedford De Angelo Road	52.4	60.2	71.2	53.8	6.4
35	Lexington Preston Road	50.8	59.2	74.9	55.2	4.0
36	Concord Wastewater	56.7	61.3	69.4	49.9	11.4
Note: 1. High noise levels in 2017 are likely due to wildlife damage to the windscreen Source: Massport Noise and Operations Monitoring System, HMMH 2018						

Generally, near the airport, where aircraft noise dominates, agreement with the modeled values is best. Farther from Hanscom Field, where community noise is a significant contributor to the total DNL, agreement is not as good because the measured value includes all noise sources and the modeled value only includes aircraft-related noise. A notable exception to this general trend is Site 31, the Concord Localizer, which is on airport property. In 2017, wildlife damaged the windscreen on the microphone at Site 31 causing higher levels of wind noise to be included in the total DNL.



- Noise Monitoring Locations
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Interstate
- Highway
- Road



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Noise Monitoring Locations

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NearMap USA (Aerial) July 30, 2018

Figure 7-11

7.5 Residential Land Use Impacts

The following sections describe the assessment of land use impacts around Hanscom Field using techniques and criteria based on scientific research, federal law, and FAA recommended guidelines.

7.5.1 Land Use Compatibility Standards

Based on the relationships between noise and the collective response of people to their environment, DNL is the standard noise metric for evaluating community noise exposure and decision-making regarding the compatibility of land uses by most federal agencies in the U.S.

In their application to airport noise in particular, DNL projections have two principle functions:

- ⇒ To provide a means for comparing existing noise conditions with those that may result from the implementation of noise abatement procedures and/or from forecast changes in airport activity.
- ⇒ To provide a quantitative basis for identifying and judging potential effects of aviation noise on people.

Both of the principle functions of DNL projections suggest the need for objective criteria. Government agencies dealing with environmental noise have devoted significant attention to this issue, and thus have developed noise/land use compatibility guidelines to help federal, state, and local officials with this evaluation process.

To help address land use planning issues, the FAA has determined that DNL is the official cumulative noise exposure metric for use in airport noise analyses, as

prescribed by 14 CFR Part 150. Part 150 includes FAA's recommended guidelines for noise/land use compatibility evaluation, based on a compilation of extensive scientific research into noise-related activity interference and attitudinal response. These guidelines suggest that DNL values of 65 dB and lower are compatible with all land uses including residential land use.

Research by the U.S. EPA

Pursuant to the Noise Control Act of 1972, the U.S. EPA initiated this effort by publishing scientific data on the effects of noise on people under various levels of exposure. The Agency's preliminary findings were followed in 1974 by a technical report entitled Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, otherwise known as the "Levels Document." This document is still widely cited for its applicability to environmental assessments, and many of its original findings, while refined in more recent years, remain pertinent to understanding how people respond to noise.

EPA is careful to point out that the Levels Document in no way constitutes a regulation or standard. The report, which is the first report to identify a DNL value of 55 dB as a relevant

noise level, offers no guidelines for determining land use compatibility. The Levels Document is informational only, and does not account for economic or technological feasibility or for peoples' attitudes regarding the desirability of undertaking a project that produces impacts caused by noise. Appendix D discusses additional implications of various DNL levels and their effects on people.

Land Use Analysis Methodology

The number of people residing in the DNL contours for 2017 was estimated from existing land use data and 2010 census data obtained from the U.S. Census Bureau. A detailed discussion of this methodology is provided in Appendix D. Table 7-10 presents the population by town exposed to DNL ranges of 65 dB and above (the FAA's compatibility guideline), and also within lower DNL ranges of 60 to 65 dB, and 55 to 60 dB. The information generated for Year 2017 is compared to past analyses for 2005 and 2012.

Table 7-10 Estimated Population within Hanscom Field 2017 DNL Contours

Town	Total Population between DNL Contours:				
	70 dB or Greater	65 to 70 dB	60 to 65 dB	55 to 60 dB	Total 55 dB or Greater
2005					
Bedford	0	17	256	872	1,145
Concord	0	0	209	1,075	1,284
Lexington	0	0	0	524	524
Lincoln	0	0	0	0	0
Total	0	17	465	2,471	2,953
2012					
Bedford	0	0	87	369	456
Concord	0	0	0	542	542
Lexington	0	0	0	43	43
Lincoln	0	0	0	0	0
Total	0	0	87	954	1,041
2017					
Bedford	0	0	78	491	569
Concord	0	0	3	446	449
Lexington	0	0	0	245	245
Lincoln	0	0	0	8	8
Total	0	0	81	1,190	1,271

Source: HMMH 2018

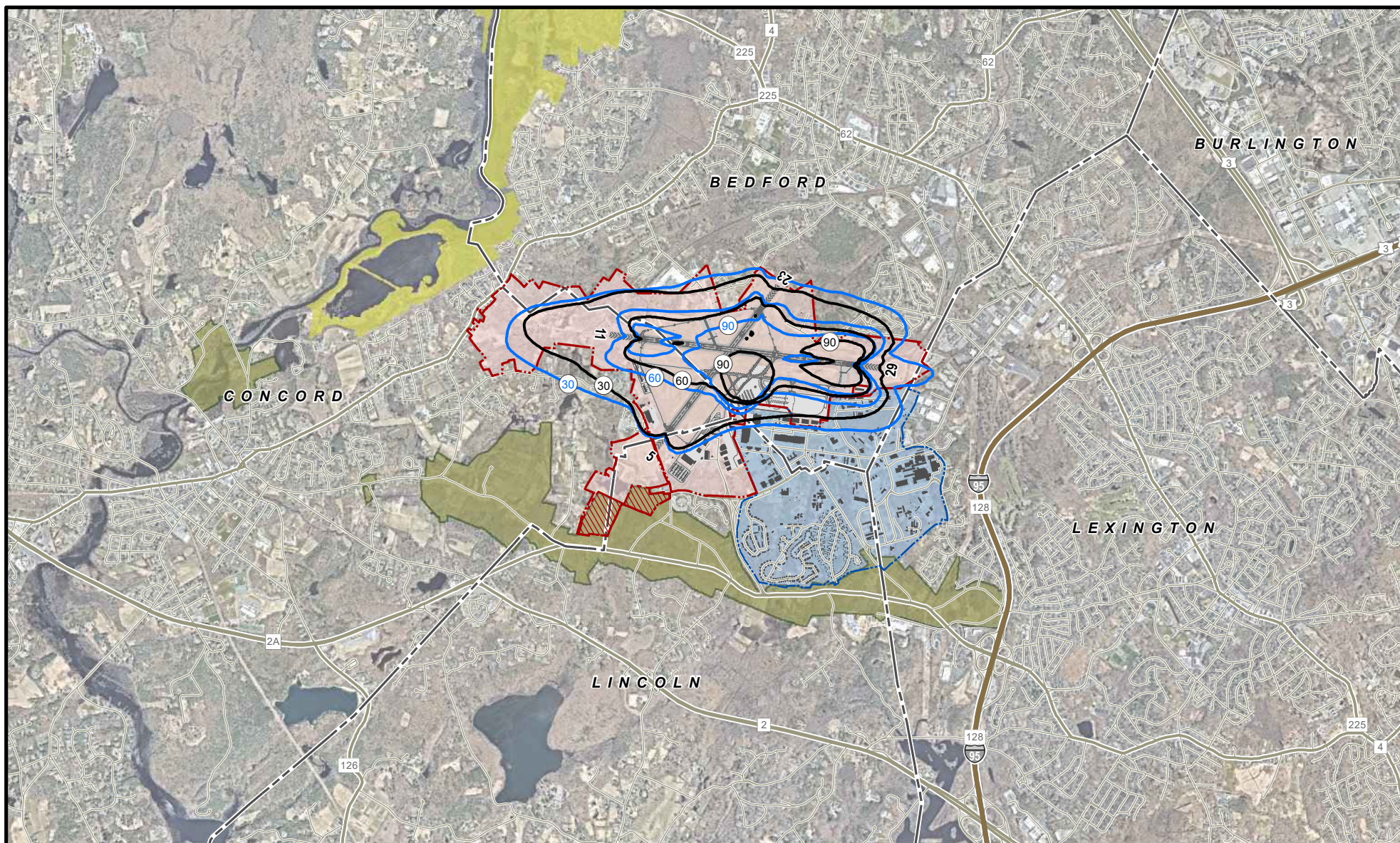
Total population exposed to DNL greater than 65 dB decreased from 17 residents in 2005 to zero in 2012 and 2017. The total population in the four towns exposed to DNL values of 55 dB or greater decreased from 2,953 in 2005 to 1,411 in 2012 and increased to 1,271 in 2017. Concord was the only town recording a decrease in the population exposed to a DNL of 55 dB or greater between 2012 and 2017 due the decreased annual use of Runway 29 associated with the runway closure.







7.5.2 Time Above







A Time Above threshold level of 65 dBA is considered useful when considering speech interference. People can generally carry on acceptable outdoor conversations in a normal voice at typical communication distances of three to four feet as long as the background noise (in this case, aircraft) remains less than 65 dBA. In addition, in a house with open windows, a 65 dBA sound level outdoors produces an indoor sound level that is low enough to permit relaxed conversation at communication distances up to about six feet.

In the 2017 *ESPR*, like the 2005 and 2012 *ESPRs*, Massport has also provided information on Time Above a lower threshold of 55 dBA. Outdoor conversations at a normal voice effort in the presence of these lower levels are typically acceptable to distances of ten to 15 feet, and indoors with windows open conversations would be acceptable using a normal voice effort at distances of 15 feet or more (see Appendix D).

The 2017 *ESPR* reports the results in the form of contours showing areas where aircraft noise exceeds the two threshold sound levels of 65 and 55 dBA for periods of 30, 60, and 90 minutes per day. Figure 7-12 presents TA 65 dBA contours and Figure 7-13 presents the TA 55 dBA contours. The cumulative areas within the TA contours for 2005, 2012, and 2017 are presented in Table 7-11. The data is divided between Massport property, Hanscom Air Force Base (AFB), and off property (meaning outside Hanscom Field and Hanscom AFB). The sizes of the TA 55 dBA and TA 65 dBA contours generally decreased in 2017 relative to 2012 for the 30 minute, 60 minute, and 90 minute contours. Slower aircraft, such as single engine piston propeller aircraft, have higher contributions to Time Above than a faster aircraft with a similar sound level due to the increased time the aircraft spends in the vicinity of the airport for each operation. Both local and itinerant operations by these aircraft decreased between 2012 and 2017.



-  2017 Time Above 65 dBA Contours (Minutes)
-  2012 Time Above 65 dBA Contours (Minutes)
-  Hanscom Field Property Boundary
-  Massport Property within MMNHP Congressional Boundary
-  Hanscom AFB Property Boundary
-  Municipal Boundary

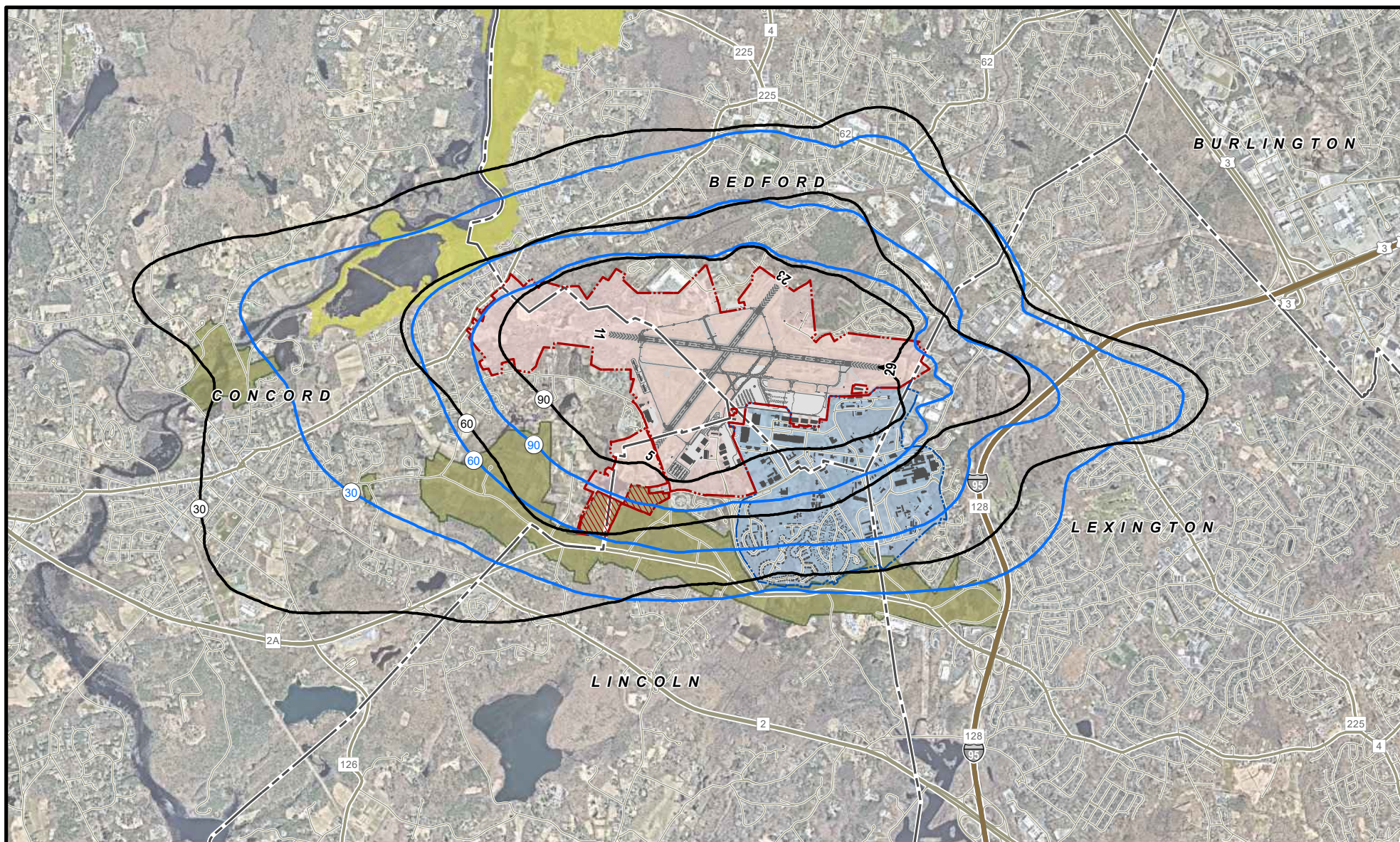
-  Historic Road
-  Interstate
-  Highway
-  Road
-  MMNHP Boundary
-  Great Meadows



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2017 Time Above 65 dBA Contours

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018



- 2017 Time Above 55 dBA Contours (Minutes)
- 2012 Time Above 55 dBA Contours (Minutes)
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- MMNHP Boundary
- Great Meadows



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2017 Time Above 55 dBA Contours

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018

Figure 7-13

Table 7-11 2017 Area within Time Above 65 and 55 dBA Contours

Time Above Contour Level	Cumulative Area (Acres)											
	2005	2005	2005	2005	2012	2012	2012	2012	2017	2017	2017	2017
		Massport	AFB	Off Airport		Massport	AFB	Off Airport		Massport	AFB	Off Airport
TA 65 dBA Contour												
90 mins	281	279	0	2	289	275	0	14	100	100	0	0
60 mins	498	468	8	22	526	489	12	25	405	394	0	11
30 mins	1,326	956	78	292	1,238	933	89	216	996	833	43	120
TA 55 dBA Contour												
90 mins	1,828	1,060	166	602	2,362	1247	336	779	1,729	1,078	166	485
60 mins	3,551	1,254	447	1850	4,006	1301	640	2,065	3,566	1,301	398	1,868
30 mins	8,405	1,302	761	6342	7,542	1,302	782	5,458	9,209	1,302	762	7,146
Source: HMMH 2018												

Table 7-12 presents the population between the contour levels for the TA 65 and 55 dBA metrics for 2005, 2012, and 2017. The upward trend in jet operations contributes to the increased size of the TA 55 dB 30 minute contour, which is the farthest TA contour from the airport. The largest area of increase in the TA 55 dB 30 minute contour lies under the Runway 29 departure turn to the south of Hanscom Field. This area lies over a relatively well-populated area of Concord, which results in an increase in the population within the TA 55 dB 30 minute contour in 2017 compared to 2012. Appendix D describes the methodology used to compute these population counts based on the contour geometry, US Census data, and land use polygons.

Table 7-12 2017 Population within Time Above 65 and 55 dBA Contours

Time Above Contour Level	Population between Contours		
	2005	2012	2017
TA 65 dBA Contour			
90 minutes or greater	0	0	0
60 to 90 minutes	50	52	6
30 to 60 minutes	470	349	175
Total 30 minutes or greater	520	401	181
TA 55 dBA Contour			
90 minutes or greater	937	1,139	696
60 to 90 minutes	1,301	2,610	2,001
30 to 60 minutes	9,112	6,234	9,391
Total 30 minutes or greater	11,350	9,983	12,088
Source: HMMH 2018			

7.5.3 Total Noise Exposure (EXP)

Table 7-13 presents the EXP for 2017 at Hanscom Field. Appendix D presents detailed results of the 2017 EXP calculation. The total EXP for civil departures was 106.7 dB using AEDT Version 2d. Table 7-14 presents a historic comparison of EXP values from 1987 to 2017 using increasingly updated versions of the INM as discussed earlier in this chapter.

Table 7-13 Year 2017 Total Noise Exposure (EXP) (in dB)

Groups	Departure Only	Arrival Only	Total
All civil aircraft except single piston	105.8	109.6	111.1
All civil aircraft	106.7	110.4	111.9
All military aircraft	102.6	95.3	103.3
All civil and military aircraft except single piston	107.5	109.8	111.8
All civil and military aircraft	108.2	110.5	112.5
Source: Massport EXP System 2018			

Table 7-14 Historic Trends in EXP

Noise Model	Year	Civilian Aircraft Departure EXP
INM Version 3.9	1987	112.0
	1988	112.4
	1989	111.6
	1990	110.8
	1991	110.7
	1992	111.4
	1993	110.6
	1994	111.4
	1995	111.6
INM Version 5.1	1996	112.0
	1997	112.3
	1998	113.1
	1999	113.0
INM Version 6.0c	2000	112.3
	2001	111.6
	2002	112.4
	2003	111.9
	2004	111.9
INM Version 6.1	2005	111.4
	2006	111.0
	2007	111.3
	2008	110.2
	2009	109.2
	2010	109.2
	2011	109.1
	2012	107.4
	2013	108.5
	2014	108.6
	2015	108.2
INM Version 7.0c	2016	106.8
AEDT Version 2d	2017	106.7
Source: Massport and HMMH, 2018		

7.5.4 SEL Contours

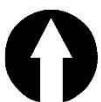
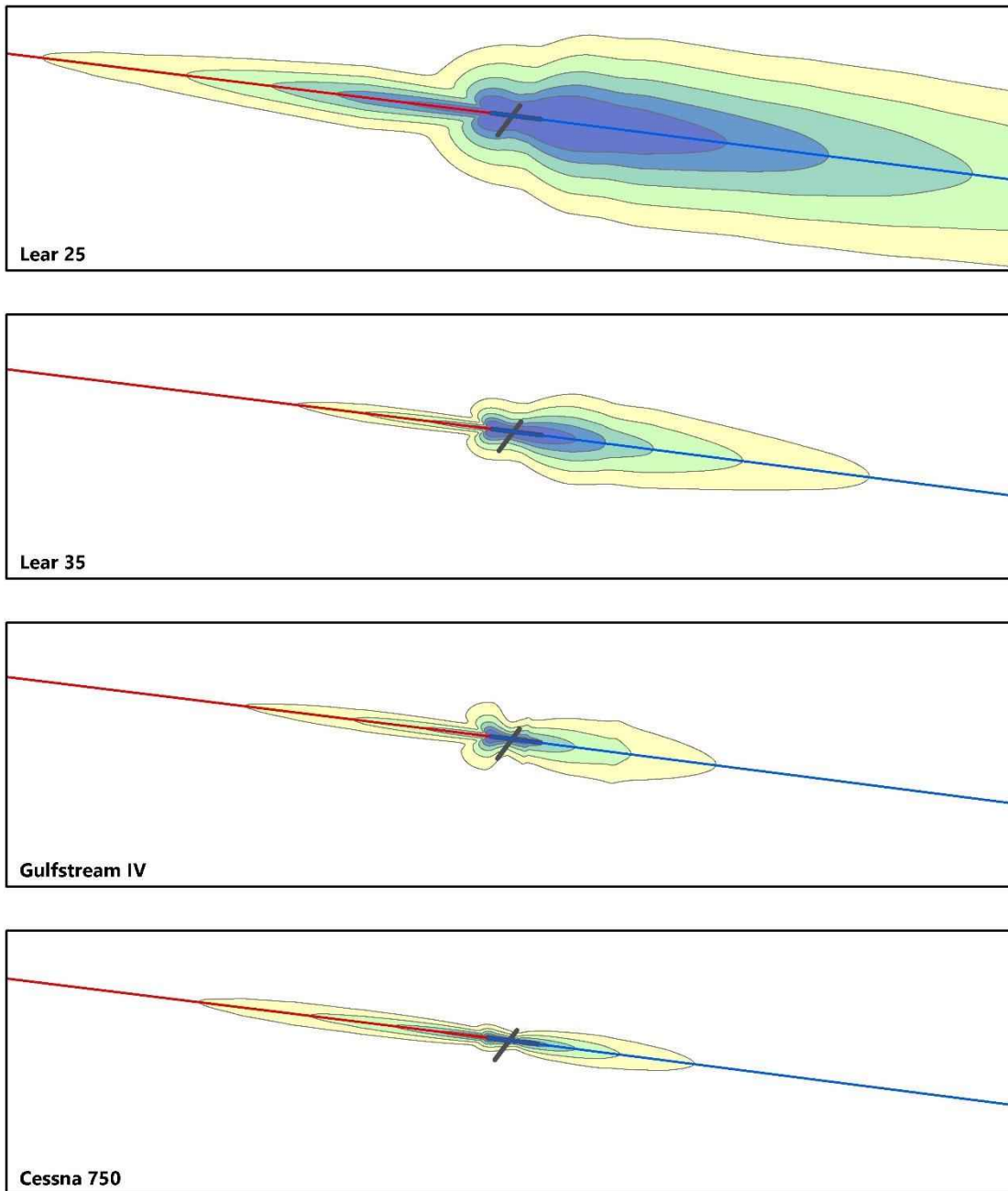
Figures 7-14 and 7-15 depict contours for comparison of single-event noise levels for some common aircraft types at Hanscom Field. Figure 7-14 presents SEL contours for departure and arrival of four typical general aviation jets: the Lear 25, the Lear 35, the Gulfstream IV, and the Cessna 750. The Lear 25 is a typical Stage 2 Corporate Jet, whereas the Lear 35, the Gulfstream IV, and the Cessna 750 are Stage 3 Corporate Jets.⁹⁴

This figure shows that at any given location, SELs for Stage 2 aircraft are typically 10 to 15 dB higher than the Stage 3 aircraft. Keeping in mind the logarithmic nature of decibels, a single operation by one of the Stage 2 jets will have 10 times the influence on the total noise level (DNL or EXP) as a Stage 3 jet. At the end of 2015, Stage 2 civil jets were prohibited by federal law from operating in the United States, so while these jets were present in small numbers in the 2012 *ESPR* noise contours, they are not present in the 2017 *ESPR*. Note that the phase out of Stage 2 jets does not apply to military aircraft.

Figure 7-15 shows the departure single-event noise contours for common propeller aircraft at Hanscom Field: a de Havilland DHC-6 twin turboprop, a Cessna 208 single engine turboprop, a Beechcraft Baron 58 twin-engine piston propeller, and a single engine piston propeller.

⁹⁴ In 2012, Congress passed the FAA Modernization and Reform Act, which included the phase out of all non-stage 3 civil aircraft by December 31, 2015.

Figure 7-14 SEL Contours for Common General Aviation Jet Aircraft



Scale in Statute Miles (1 mi = 5,280 ft)

0 2.5 5 10 Miles

SEL 95

SEL 90

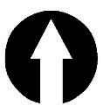
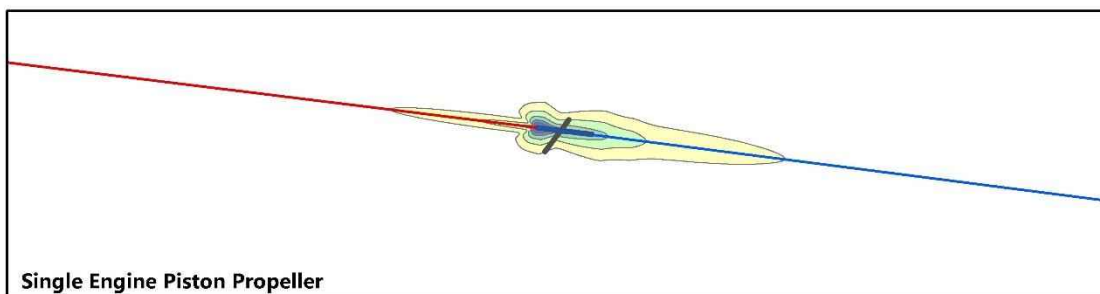
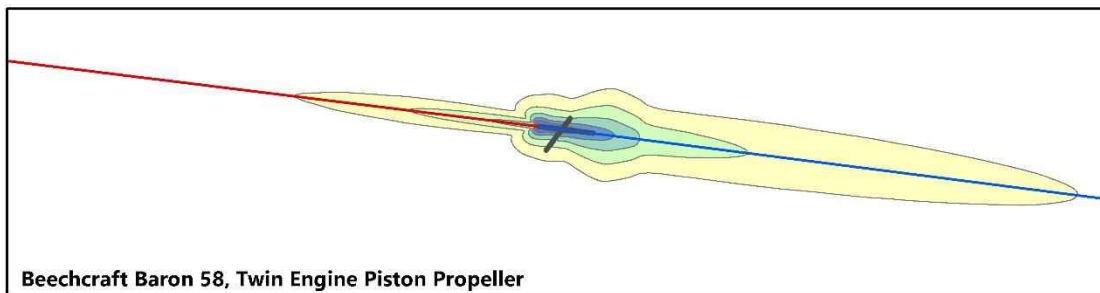
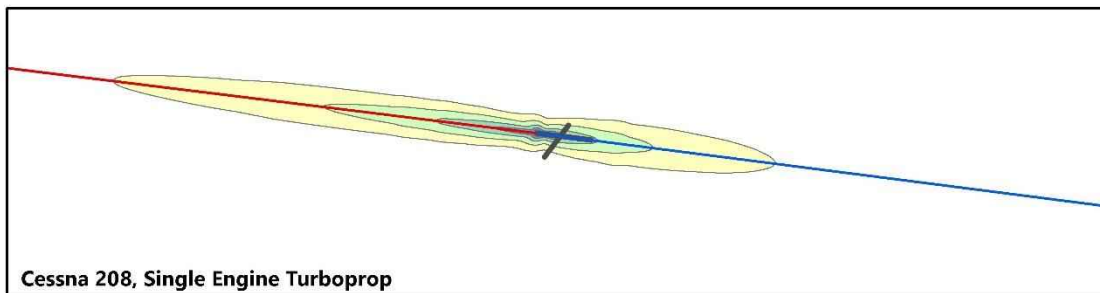
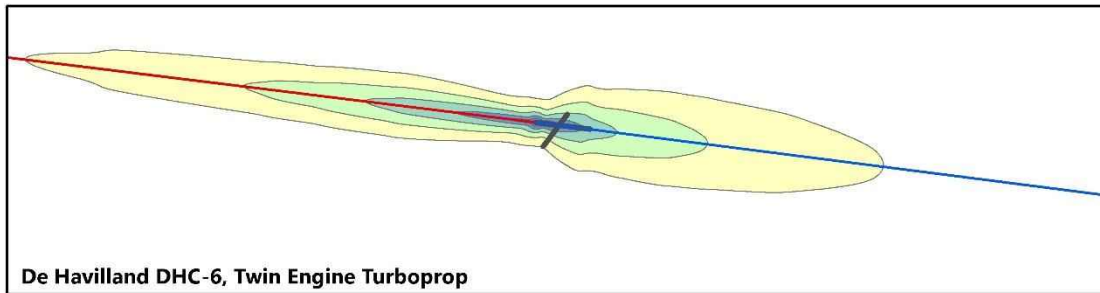
SEL 85

SEL 80

SEL 75

Source: HMMH 2018

Figure 7-15 SEL Contours for Common Propeller Aircraft



Scale in Statute Miles (1 mi = 5,280 ft)

0 2.5 5 10 Miles

SEL 95

SEL 90

SEL 85

SEL 80

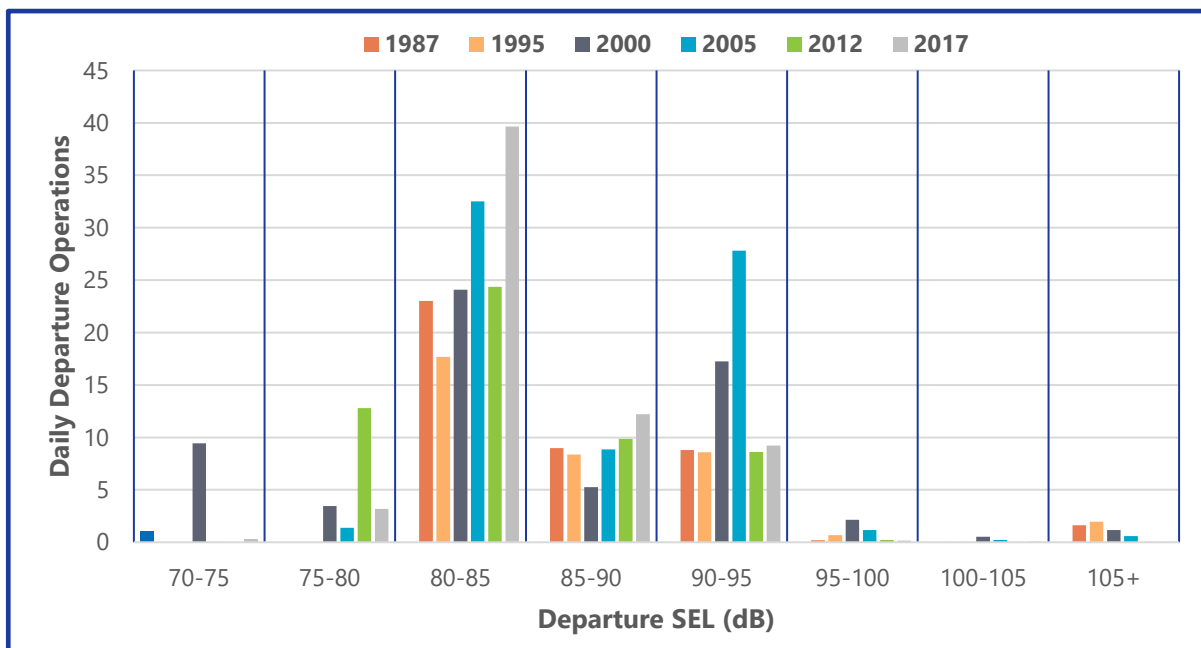
SEL 75

Source: HMMH 2018

In order to understand the distribution of noise levels created by aircraft at Hanscom Field, the AEDT-computed SEL for each aircraft departing the airport (the same metric used in the computation of EXP) was grouped into a 5-decibel increment with all other aircraft producing similar noise levels, and the number of daily occurrences was tallied for 2017.

Figure 7-16 presents a plot of the distribution of the SEL values from the EXP calculations for historical data: 1987, 1995, 2000, 2005, 2012, and 2017. Data were derived from Massport's Annual Noise Report for 1987, the 1995 GEIR for 1995, and the ESPRs for 2000, 2005, and 2012. Single engine piston propeller aircraft were excluded from the presentation so that differences between the numbers of operations by louder aircraft for the various scenarios would be clear. Inclusion of these departures (114 per day in 2017) would have compressed the y-axis to the point that these differences would have been unreadable. The figure shows that operations by the noisiest aircraft types (SEL greater than 95 dBA) decreased over time, while operations by relatively quieter aircraft types increased during that same period.

Figure 7-16 Historical Distribution of Daily Departure SELs (Excluding Single Engine Prop)



Source: Massport, HMMH 2018

7.6 Analysis of Future Scenarios

All aspects of model input required for the 2017 calculations were also necessary for analysis of future impacts. No changes were made to the airfield layout, flight tracks, or aircraft noise and performance data for the future cases. The runway use assumptions for 2025 and 2035 were derived from the average of data from 2013-2016, all years since the last ESPR, excluding 2017. Data from 2017 was excluded due to the increased use of Runway 5/23 during the closure of Runway 11/29, making this year non-representative of likely future runway use. The operations data, which consist of the types of aircraft and number of operations, were changed to reflect forecast future activity levels.

Table 7-15 through Table 7-19 show the calculated runway use by operation and aircraft group. In general, the use of Runway 11/29 is somewhat higher and the use of Runway 5/23 is somewhat lower as compared to the 2017 values presented in Tables 7-2 through Table 7-6 and better reflects historical norms at Hanscom Field.

Table 7-15 Daytime (7:00 AM to 10:00 PM) Departure Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	4.6%	1.6%	9.9%	7.4%
11	19.4%	19.1%	18.1%	18.1%
23	6.6%	0.4%	11.8%	13.2%
29	69.4%	78.9%	60.1%	61.3%
Total	100.0%	100.0%	100.0%	100.0%
Source: Massport Noise and Operations Monitoring System flight tracks 2013-2016				

Table 7-16 Nighttime (10:00 PM to 7:00 AM) Departure Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	6.2%	0.0%	27.0%	33.6%
11	20.3%	18.4%	13.1%	10.7%
23	2.9%	0.0%	8.1%	10.4%
29	70.6%	81.6%	51.8%	45.4%
Total	100.0%	100.0%	100.0%	100.0%
Source: Massport Noise and Operations Monitoring System flight tracks 2013-2016				

Table 7-17 Daytime (7:00 AM to 10:00 PM) Arrival Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	1.6%	0.0%	2.7%	3.4%
11	25.5%	25.8%	23.3%	25.5%
23	9.8%	1.0%	16.7%	15.2%
29	63.1%	73.1%	57.2%	55.9%
Total	100.0%	100.0%	100.0%	100.0%

Source: Massport Noise and Operations Monitoring System flight tracks 2013-2016

Table 7-18 Nighttime (10:00 PM to 7:00 AM) Arrival Runway Utilization

Runway	Aircraft Group			
	Corporate Jet	Large Jet	Turboprop	Piston
05	0.2%	0.0%	1.9%	2.1%
11	44.7%	39.0%	34.5%	33.8%
23	4.2%	0.0%	15.5%	16.1%
29	50.9%	61.0%	48.1%	48.0%
Total	100.0%	100.0%	100.0%	100.0%

Source: Massport Noise and Operations Monitoring System flight tracks 2013-2016

Table 7-19 Touch-and-Go Runway Utilization

Runway	Daytime (7:00 AM to 10:00 PM)	Nighttime ¹ (10:00 PM to 11:00 PM)
05	5.5%	0.0%
11	18.4%	27.2%
23	12.1%	0.0%
29	64.1%	72.8%
Total ²	100.0%	100.0%

Notes:
1. Touch-and-go operations are not allowed from 11:00 PM to 7:00 AM
2. Aircraft other than single engine pistons are not allowed to perform touch-and-go operations.
Source: Massport Noise and Operations Monitoring System flight tracks 2013-2016

The 2017 *ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3 Airport Activity Levels. The 2025 and 2035 scenarios represent estimates of what

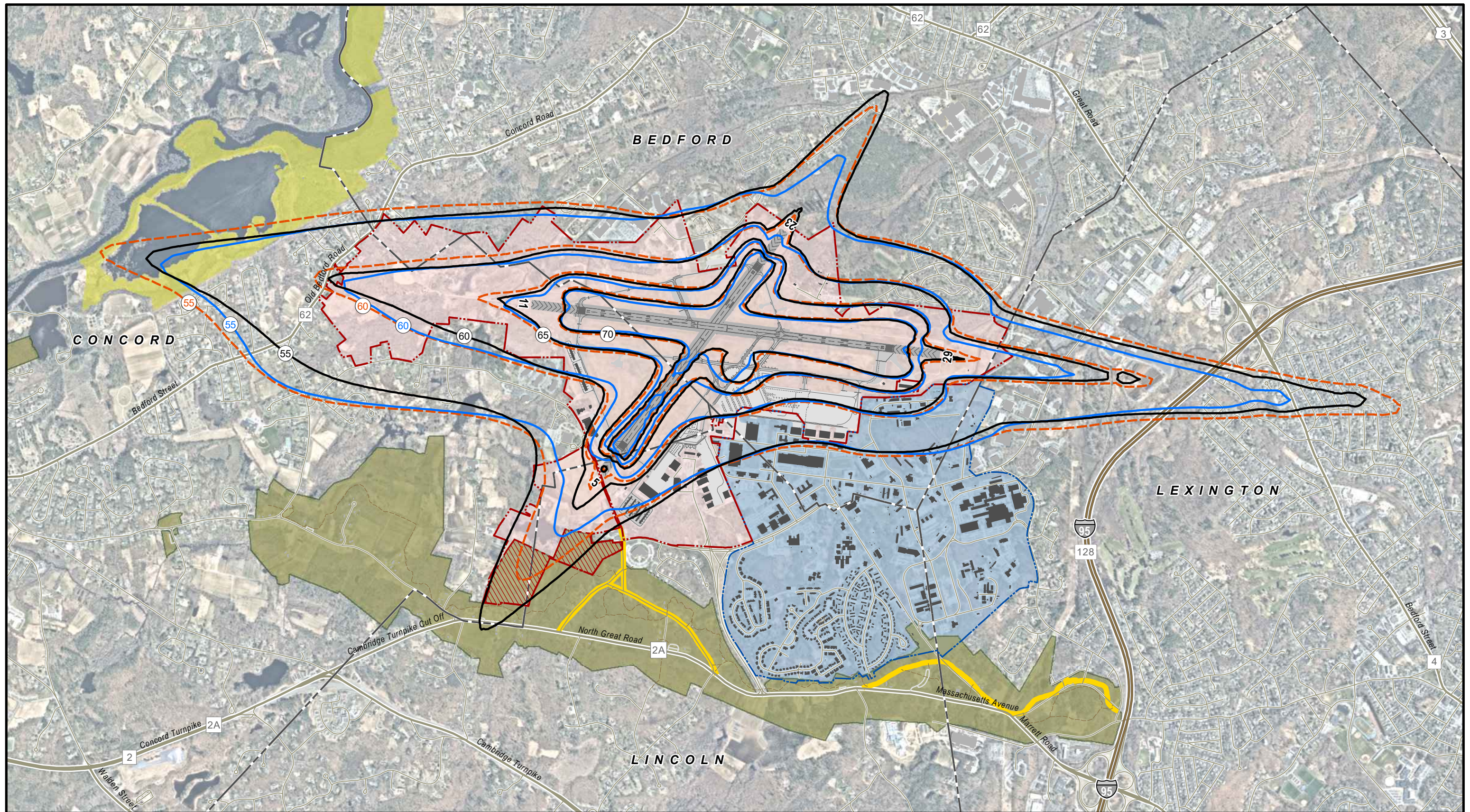
could occur (not what will occur) in the future, using certain planning assumptions and are not necessarily recommended outcomes. The future service scenarios are consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats. Table 7-20 summarizes the average daily operations for the two forecast scenarios. A more detailed breakdown of operations by individual aircraft types is included for each scenario in Appendix D.

Table 7-20 Forecast Average Daily Operations

Group	Departures		Arrivals		Total
	Daytime (7:00 AM to 10:00 PM)	Nighttime (10:00 PM to 7:00 AM)	Daytime (7:00 AM to 10:00 PM)	Nighttime (10:00 PM to 7:00 AM)	
2025					
Jets	49.6	2.9	48.2	4.2	104.9
Turbo Prop	15.2	0.4	15.1	0.5	31.1
Piston	101.2	0.2	101.1	0.4	202.9
Military	1.1	0.0	1.0	0.0	2.1
Helicopters	13.1	0.4	12.8	0.7	27.0
All Groups	180.1	3.9	178.2	5.8	368.0
2035					
Jets	56.9	3.3	55.3	4.9	120.4
Turbo Prop	19.0	0.8	18.8	0.9	39.5
Piston	98.4	0.2	98.3	0.4	197.3
Military	1.1	0.0	1.0	0.0	2.1
Helicopters	14.2	0.4	13.9	0.8	29.3
All Groups	189.5	4.7	187.3	7.0	388.5
Source: InterVISTAS, HMMH 2018					

7.6.1 DNL Contours

Figure 7-17 and 7-18 depict the 55, 60, 65, and 70 dB DNL contours for the two future scenarios. In each figure, the 2012 and 2017 contours are also shown for comparison. In both figures, the area within each contour level increases in the future scenarios. Note that the contour lobes associated with Runway 5/23 operations are generally smaller in the future scenarios than in 2017. The larger size of these lobes in 2017 was due to the closure of Runway 11/29 in August of 2017 and the associated increase in the use of Runway 5/23. The area within each contour interval is presented in Table 7-21 for 2012 and 2017 for comparison to the forecast years of 2025 and 2035. The data show growth in the DNL contours for each year from 2012 to 2035.



- 2012 DNL Noise Contour
- 2017 DNL Noise Contour
- 2025 DNL Noise Contour
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary

- Municipal Boundary
- MMNHP Boundary
- Great Meadows

- Historic Road
- Interstate
- Highway
- Road
- Trail

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018



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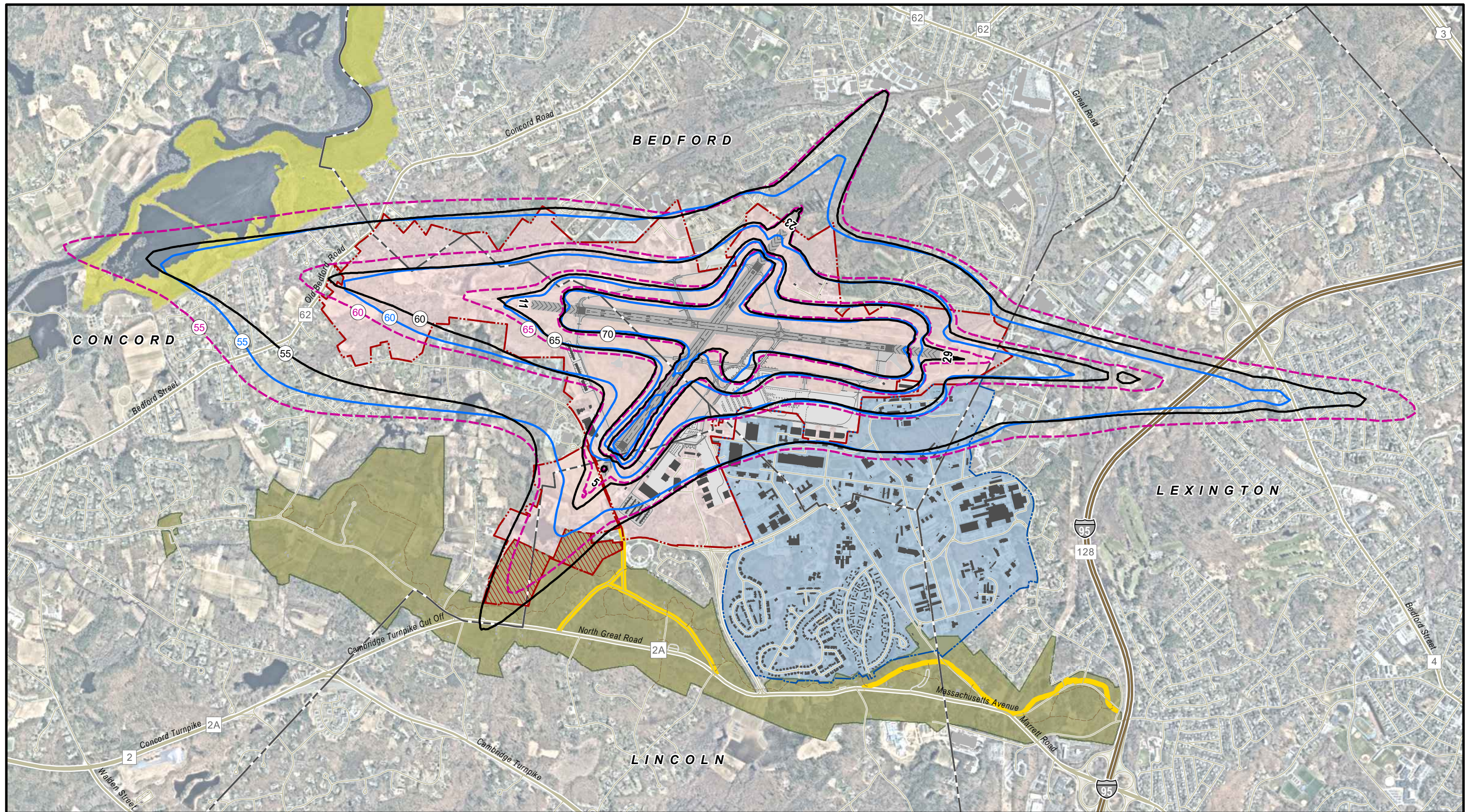
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**2012 and 2017 DNL Noise Contours
Compared to 2025 Forecast DNL
Noise Contours**

Figure 7-17



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- 2012 DNL Noise Contour
- 2017 DNL Noise Contour
- 2035 DNL Noise Contour
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary

- Municipal Boundary
- MMNHP Boundary
- Great Meadows

- Historic Road
- Interstate
- Highway
- Road
- Trail



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2012 and 2017 DNL Noise Contours Compared to 2035 Forecast DNL Noise Contours

Figure 7-18

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018



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Table 7-21 Forecast Area within DNL Contours

DNL Contours (dB)	Cumulative Area (Acres)					
	2000	2005	2012	2017	2025	2035
70	334	311	190	214	218	228
65	688	635	391	419	434	459
60	1,550	1,437	857	904	962	1,035
55	3,480	3,291	2,045	2,216	2,371	2,581
Source: HMMH 2018						

7.6.2 Residential Land Use Impacts

Population estimates were prepared for the forecast cases using year 2010 U.S. Census data and the same Geographic Information Systems (GIS) techniques described previously for the 2017 operating conditions. Table 7-22 presents the population within the 55, 60, 65, and 70 dB DNL contours for the forecast cases in 2025 and 2035. The values calculated for 2012 and 2017 are included for comparison. The areas of future growth in the contours relative to 2017 shown in Figure 7-17 and Figure 7-18 are reflected in Table 7-22. In the future, if all project operations occur, the population between the 55 dB and 60 dB DNL contours is projected to increase in all four towns except Lincoln and the population between the 60 dB and 65 dB DNL contours is projected to increase in Bedford and Concord relative to 2017.

In both forecast years, the population within the 65 dB DNL contour remains zero in all four towns.

Table 7-22 U.S. Census Population Counts within Current and Forecast DNL Contours

Town	Total Population between DNL Contours:				
	70 dB or Greater	65 to 70 dB	60 to 65 dB	55 to 60 dB	Total 55 dB or Greater
2012					
Bedford	0	0	87	369	456
Concord	0	0	0	542	542
Lexington	0	0	0	43	43
Lincoln	0	0	0	0	0
Total	0	0	87	954	1,041
2017					
Bedford	0	0	78	491	569
Concord	0	0	3	446	449
Lexington	0	0	0	245	245
Lincoln	0	0	0	8	8
Total	0	0	81	1,190	1,271
2025					
Bedford	0	0	95	499	594
Concord	0	0	11	601	612
Lexington	0	0	0	469	469
Lincoln	0	0	0	0	0
Total	0	0	106	1,569	1,675
2035					
Bedford	0	0	110	578	688
Concord	0	0	24	695	719
Lexington	0	0	0	639	639
Lincoln	0	0	0	1	1
Total	0	0	134	1,913	2,047
Source: HMMH 2018					

7.6.3 Time Above (TA)

The amount of time that aircraft noise is projected to be above the 65 and 55 dBA thresholds during the full day was also computed for the two forecast scenarios using the AEDT. Figure 7-

19 through Figure 7-22 display the contours for areas where aircraft noise exceeds each threshold of 65 and 55 dBA for 30, 60, and 90 minutes per day for each future scenario. Each figure also includes the 2017 contours for comparison. The cumulative area within each contour interval is presented for each forecast scenario in Table 7-23, with 2017 values for comparison. TA increases in area coverage for both the 65 and 55 dBA thresholds over time, which is expected with increasing activity levels. The table shows existing and future levels as well as those for 2012 for comparison. This shows that the area of the 2025 TA contours will be greater than the 2017 contours and the 2035 contours will have the largest area, assuming operations increase in accordance with the forecast. The trends of population within the TA contours will be similar to area, with increases from 2017 through 2035, as shown in Table 7-24.

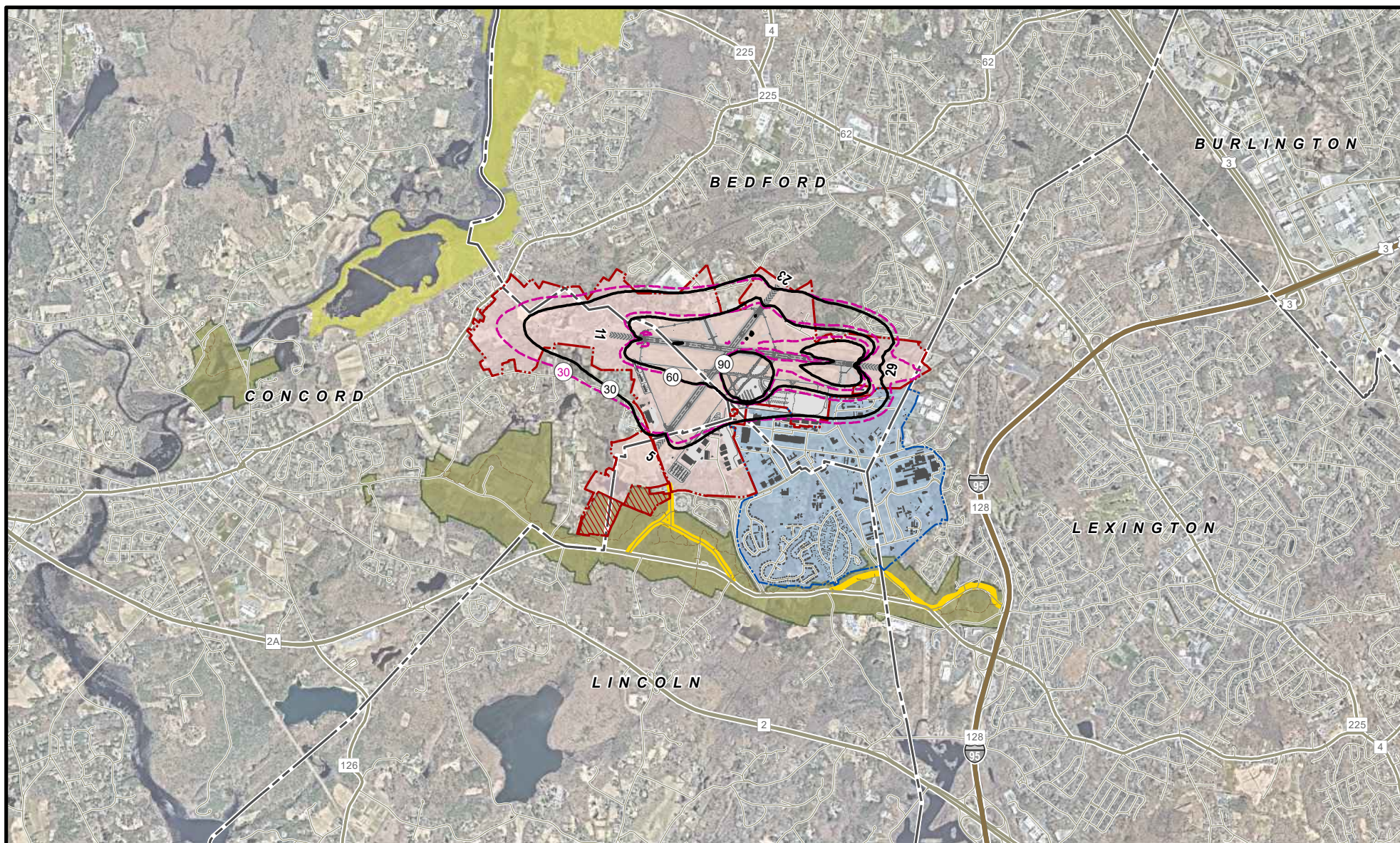
No federal or other criteria exist for judging the relevance of these reported numbers. Both the acreage and the selected TA contour levels serve primarily as a secondary means of helping to judge the change in noise environment that is expected under the forecast scenarios.







Table 7-23 Areas within Time Above 65 and 55 dBA Contours for Existing and Forecast Operations







Contour Level	Cumulative Area (Acres)			
	2012	2017	2025	2035
Time Above 65 dBA				
90 minutes	289	100	149	205
60 minutes	526	405	443	478
30 minutes	1,238	996	1,122	1,233
Time Above 55 dBA				
90 minutes	2,362	1,729	1,911	2,134
60 minutes	4,006	3,566	3,907	4,278
30 minutes	7,542	9,209	10,083	10,975
Source: HMMH 2018				

Table 7-24 Population within Time Above 65 and 55 dBA Contours for Existing and Forecast Operations

Contour Level	Population between Time Above Contours			
	2012	2017	2025	2035
Time Above 65 dBA				
90 minutes or greater	0	0	0	0
60 to 90 minutes	52	6	30	47
30 to 60 minutes	349	175	233	267
Total 30 minutes or greater	401	181	263	314
Time Above 55 dBA				
90 minutes or greater	1,139	696	861	1,072
60 to 90 minutes	2,610	2,001	2,321	2,513
30 to 60 minutes	6,234	9,391	10,568	11,396
Total 30 minutes or greater	9,983	12,088	13,750	14,981
Source: HMMH 2018				



-  2017 Time Above 65 dBA Contours (Minutes)
-  2025 Time Above 65 dBA Contours (Minutes)
-  Hanscom Field Property Boundary
-  Massport Property within MMNHP Congressional Boundary
-  Hanscom AFB Property Boundary
-  Municipal Boundary

-  Historic Road
-  Interstate
-  Highway
-  Road
-  MMNHP Boundary
-  Great Meadows

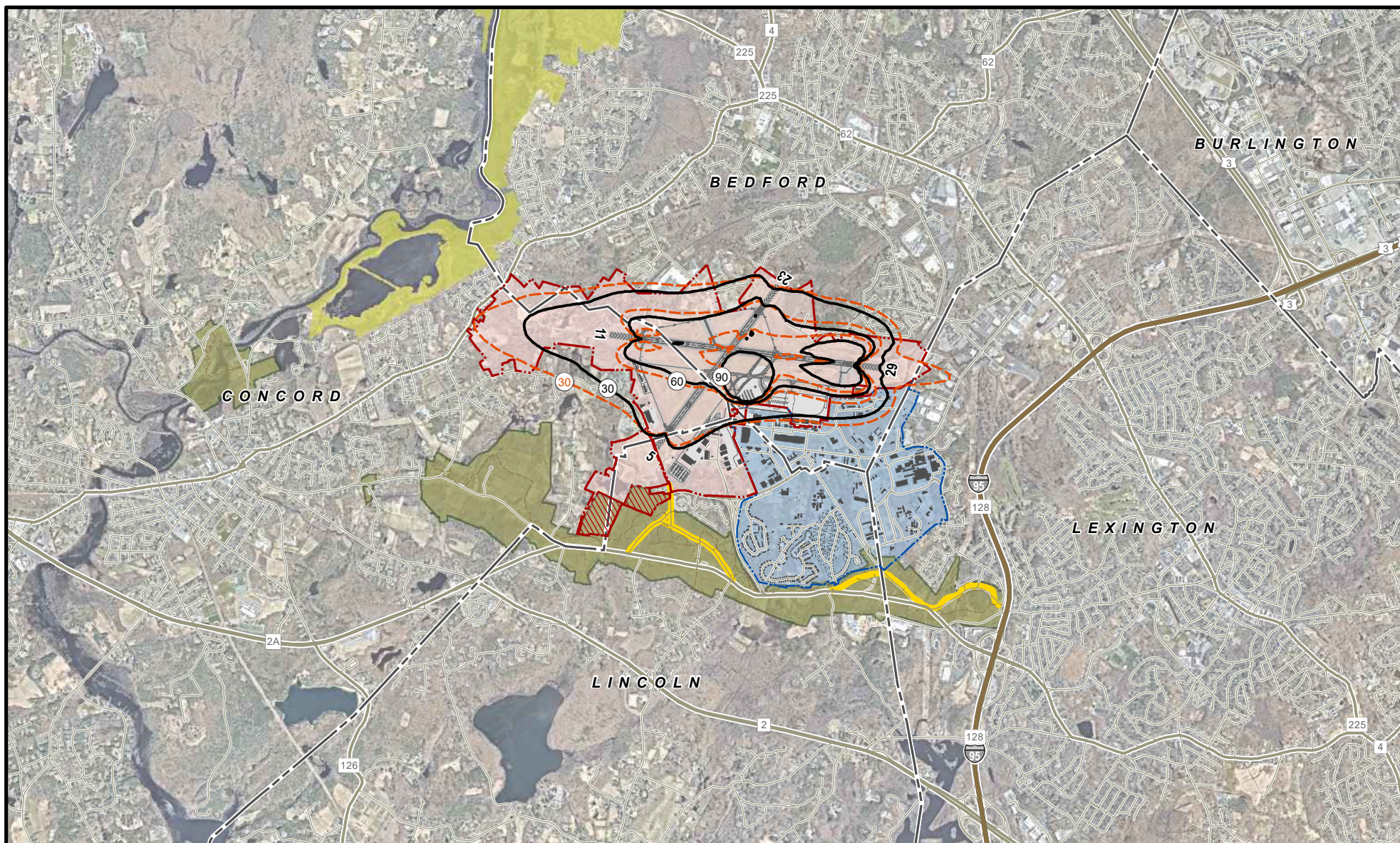


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**2017 and 2025 Forecast
Time Above 65 dBA Contour
Comparison**

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018

- 2017 Time Above 65 dBA Contours (Minutes)
- 2035 Time Above 65 dBA Contours (Minutes)
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- MMNHP Boundary
- Great Meadows

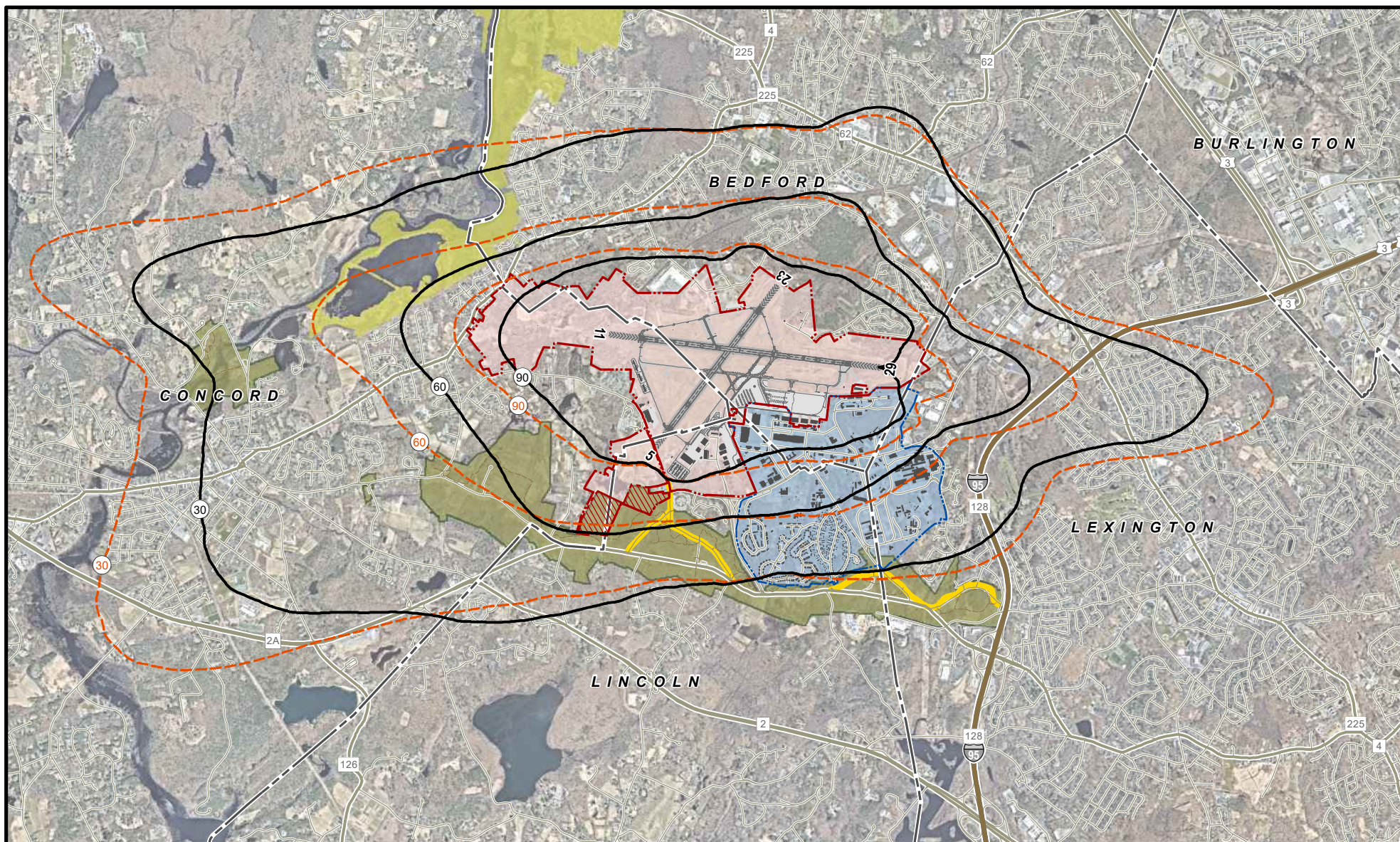


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2017 and 2035 Forecast
Time Above 65 dBA Contour
Comparison

Figure 7-20



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018

- 2017 Time Above 55 dBA Contours (Minutes)
- 2035 Time Above 55 dBA Contours (Minutes)
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- MMNHP Boundary
- Great Meadows

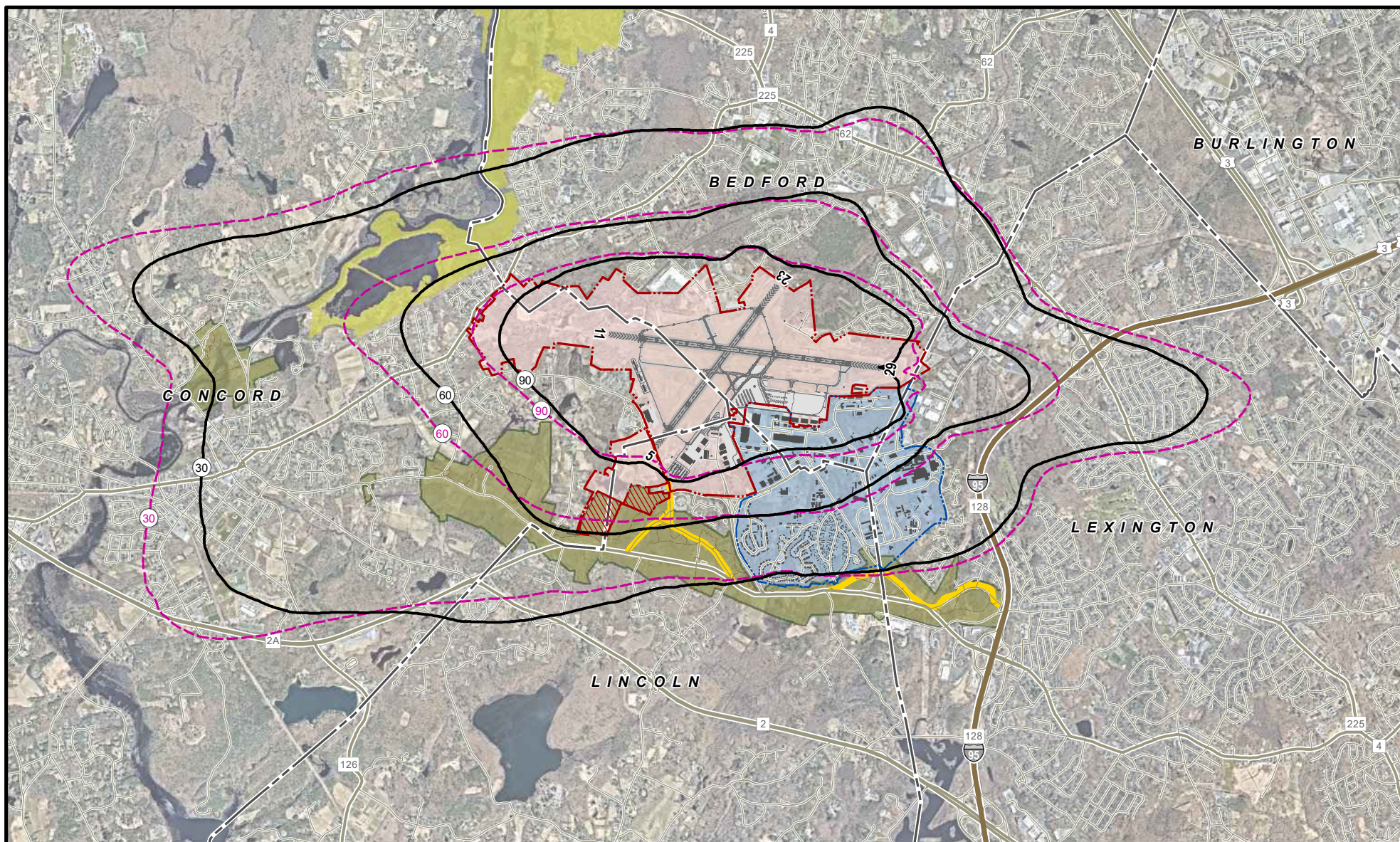


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2017 and 2035 Forecast
Time Above 55 dBA Contour
Comparison

Figure 7-22



- 2017 Time Above 55 dBA Contours (Minutes)
- 2025 Time Above 55 dBA Contours (Minutes)
- Hanscom Field Property Boundary
- Massport Property within MMNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
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- Highway
- Road
- MMNHP Boundary
- Great Meadows



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**2017 and 2025 Forecast
Time Above 55 dBA Contour
Comparison**

Figure 7-21

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; NearMap USA (Aerial) July 30, 2018

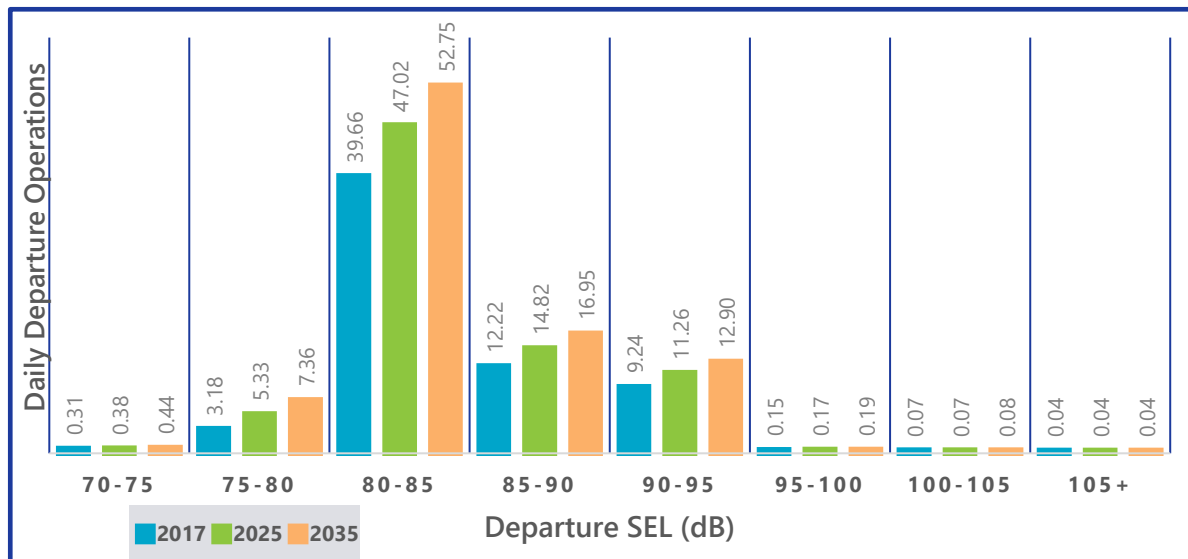
7.6.4 Total Noise Exposure (EXP)

The operations forecasts were also analyzed to compute EXP values, as summarized in Table 7-25. The primary means of tracking the metric is through civil air departures, highlighted in bold in the table. As expected, the EXP computations show the same trends as the DNL forecasts. Compared to 2017, the component attributable to civil departures is projected to increase for both the 2025 and 2035 forecasts from 106.7 dB in 2017 and to 107.4 in 2025 and 107.9 dB in 2035, respectively. These are broadly indicative of the change in DNL values among the various scenarios, consistent with the original reason for developing EXP in the first place.

Table 7-25 Year 2017 Total Noise Exposure (EXP) for Existing and Forecast Operations (in dB)

Groups	Departure Only	Arrival Only	Total
2017			
All civil aircraft except single piston	105.8	109.6	111.1
All civil aircraft¹	106.7	110.4	111.9
All military aircraft	102.6	95.3	103.3
All civil and military aircraft except single piston	107.5	109.8	111.8
All civil and military aircraft	108.2	110.5	112.5
2025			
All civil aircraft except single piston	106.7	110.5	112.0
All civil aircraft	107.4	111.1	112.7
All military aircraft	102.5	94.9	103.2
All civil and military aircraft except single piston	108.1	110.7	112.6
All civil and military aircraft	108.6	111.2	113.1
2035			
All civil aircraft except single piston	107.3	111.3	112.7
All civil aircraft	107.9	111.8	113.3
All military aircraft	102.5	94.9	103.2
All civil and military aircraft except single piston	108.5	111.4	113.2
All civil and military aircraft	109.0	111.9	113.7
Note: 1. Civil air departures, which are the primary means of tracking EXP, are highlighted in bold. Source: HMMH 2018			

Figure 7-23 Existing and Forecast Distribution of Daily Departure SELs (Excluding Single Engine Prop)



Source: HMMH 2018

7.6.5 Distribution of Noise Events

Figure 7-23 shows the forecasted distribution of daily departure SELs from the EXP calculations for each of the two future scenarios with the values for 2017 shown for comparison. As with the historical data, single engine piston operations are excluded for the clarity of the figure. The figure illustrates the changes in operations over time: growth is forecasted for operations at all noise level categories with the exception of the noisiest groups (greater than 95 dB). Operations by these louder aircraft are generally very small in number and are expected to remain small. Operations by single engine pistons which would be shown in the 75-80 dB SEL category are expected to decrease in the future.

7.7 Noise Analysis Locations

Noise analysis locations are described in this section. Information from the 2012 *ESPR* was reviewed and updated to confirm use and address location and identify new facilities. Tables 7-26 through 7-29 list the locations of noise analysis locations within the vicinity of Hanscom Field. Further input was solicited from the Town Planners and Historic Commissions of Bedford, Concord, Lexington, and Lincoln and the National Park Service. The labeling format of the noise analysis locations indicates their use. Consistent with the 2012 *ESPR*, this format also delineates the location of the site by town.

None of these sites is currently exposed to a DNL value above the FAA land use compatibility recommendation of 65 dB and none is within the 60 dB DNL contour. Only two sites (both in Concord) that have DNL values greater than 55 dB in 2017:

- ⇒ Deacon John Wheeler/Capt. Jonas Minot Farmhouse, NC-18, in Concord at 57.8 dB; and
- ⇒ Wheeler-Meriam House, NC-19, in Concord at 57.7 dB.

The DNL generally increased between 2012 and 2017. The average increase in DNL across all sites was 1.1 dB, with sites in Bedford recording an average of increase of 1.6 dB, 0.5 dB in Concord, 1.1 dB in Lexington, and 2.5 dB in Lincoln.

The largest individual DNL increase was 4.0 dB, from 42.5 dB to 46.5 dB, at the Henry Higginson House on Baker Farm Rd. in Lincoln. The largest individual DNL decrease was -0.9 dB, from 53.6 dB to 52.7 dB, at the Ripley School on Meriam Rd. in Concord. Generally, areas with lower noise levels are more susceptible to larger changes due to normal shifts in runway and flight corridor utilization.

The largest changes for sites with a 2012 or 2017 *ESPR* DNL of 50 dB or more were the aforementioned decrease of 0.9 dB at the Henry Higginson House and an increase of 3.5 dB, from 48.4 dB to 51.9 dB, at the Daniel Brooks House on Brooks Rd. in Lincoln. All six of the locations with a DNL decrease had a DNL of 50 dB or greater in 2012.

The computed noise levels at the noise analysis locations show results consistent with the DNL contours and population assessments. The 2035 forecast scenario would yield the highest DNL values with the exception of sites within Bedford and Lincoln that experienced atypical noise levels in 2017 due to the closure of Runway 11/29.

No noise analysis locations are projected to be exposed to a DNL of 60 dBA or above in 2025 or 2035. Three sites would be exposed to DNL values between 55 and 60 dB in the 2025 and 2035 scenarios including:

- ⇒ Deacon John Wheeler/Capt. Jonas Minot Farmhouse, NC-18, in Concord at 58.6dB DNL in 2025 and 59.0 dB DNL in 2035;
- ⇒ Wheeler-Meriam House in Concord, NC-19, at 58.4 dB DNL in 2025 and 58.8 dB DNL in 2035;
- ⇒ Simonds Tavern, NLX-1, in Lexington at 55.3 dB DNL in 2025 and 55.9 dB DNL in 2035.

While future noise levels at noise analysis locations are generally predicted to increase relative to the year 2017, the importance of any differences from one scenario to the next depends both on the absolute value of the projected DNL as well as on the magnitude of the change. Noise impact criteria are used to determine areas for further analysis and possible mitigation when completing environmental documentation for a specific project at an airport. Though the 2017 *ESPR* is not an environmental permitting document for a specific project, the use of these criteria help to highlight notable changes in the noise environment at Hanscom Field.

FAA Order 1050.1F, "Environmental Impacts: Policies and Procedures"⁹⁵, identifies a change of 1.5 dB or more at a "noise-sensitive area"⁹⁶ as a threshold for further analysis. FICON clarifies the FAA position by recommending a tiered approach be used to screen noise impacts. The 1.5 dB threshold of significance for noise-sensitive areas within the 65 dBA DNL contour is used for initial screening. If such changes are found to occur, additional analysis of noise analysis locations is to be conducted between DNL values of 60 and 65 dB to determine whether those noise analysis locations would experience changes of 3 or more dB.⁹⁷ No noise analysis sites had a DNL of 60 dB or greater in 2017 and no site is projected to have a DNL of 60 dB or greater in either of the forecast years.

Table 7-26 through Table 7-29 present the DNL at the noise analysis locations at each town, accompanied by a summary of the results. Time Above results for the noise analysis locations in each town are presented in Appendix D.

Table 7-26 presents the DNL at the noise analysis locations in Bedford for 2005, 2012, 2017 and the projected DNL for 2025 and 2035. Examination of the results yields the following conclusions:

- ⇒ No sites in Bedford were at or above 55 dB DNL in 2017.
- ⇒ In 2017, all sites increased in DNL relative to 2012 due to increased operations on Runway 5/23.
- ⇒ Most sites are forecast to be slightly below 2017 DNL levels in 2025 and slightly above 2017 DNL levels in 2035.
- ⇒ No sites are forecast to be at or above 55 dB DNL in 2025 and 2035.

⁹⁵ U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Environmental Impacts: Policies and Procedures, FAA Order 1050.1F, Washington, DC.

⁹⁶ Using FAA guidelines, "noise-sensitive areas" are generally assumed to be residential areas within the DNL 65 dB contour.

⁹⁷ Federal Interagency Committee on Noise (FICON), Federal Agency Review of Selected Airport Noise Analysis Issues. August 1992. FICON did not address noise levels below DNL 60 dBA because it considered noise predictions below that level to be less reliable.

Table 7-26 DNL at Noise Analysis Locations in Bedford (dB)

Label ¹	Name ²	Address (Bedford)	DNL				
			2005	2012	2017	2025	2035
HB-1	Veterans Administration Medical Center*	200 Springs Rd	43.1	41.8	43.8	43.8	44.2
NB-1	Bedford Historic District	Great Rd.	44.3	44.6	46.1	46.0	46.2
NB-2	Old Bedford Center Historic District	Great Rd.	46.0	45.4	47.1	46.9	47.1
NB-3	Old Burying Ground	7 Springs Rd.	47.0	45.7	47.4	47.2	47.5
NB-4	Old Town Hall	16 South Rd.	47.5	46.1	47.8	47.6	47.9
NB-5	Bedford Depot Park Historic District	80 Loomis St./120 South Rd.	53.7	49.8	52.0	51.6	52.1
NB-6	Nathaniel Page House	89 Page Rd.	50.7	45.9	48.4	48.1	48.6
NB-7	Christopher Page House	50 Old Billerica Rd.	48.9	44.2	46.9	46.6	47.1
NB-8	Bacon-Gleason-Blodgett Homestead	118 Wilson Rd.	44.2	41.5	43.3	43.5	43.9
NB-9	Historic Wilson Mill-Old Burlington Road Historic Dist.	Old Burlington and Wilson Rds.	44.1	41.3	43.1	43.4	43.8
NB-10	Shawsheen Cemetery **	Shawsheen Rd.	46.4	45.2	46.4	46.6	46.8
NB-11	David Lane House	137 North Rd.	-	42.1	43.9	43.8	44.0
OB-1	Old Billerica Road Area ** (NR nomination form in process)	Old Billerica Rd	48.0	44.0	47.6	47.1	47.7
PB-1	Town Hall *	10 Mudge Way	45.9	45.5	47.1	47.0	47.2
PB-2	Library **	7 Mudge Way	44.7	45.0	46.4	46.3	46.5
PB-3	Bedford School District	11 Mudge Way	45.9	45.6	47.1	47.0	47.2
PB-4	Department of Public Works	314 Great Rd.	47.8	45.4	46.8	46.9	47.2
RB-1	The Lutheran Church of the Savior	426 Davis Rd.	50.4	48.6	49.3	49.8	50.2
RB-2	First Baptist Church of Bedford	155 Concord Rd.	44.8	46.0	47.1	47.2	47.3
RB-3	St. Michael's Church	90 Concord Rd.	43.7	44.9	46.1	46.1	46.2
RB-4	Boston Buddha Vararam Temple	125 North Rd.	41.7	42.2	44.0	43.8	44.1

Label ¹	Name ²	Address (Bedford)	DNL				
			2005	2012	2017	2025	2035
RB-5	The First Church of Christ Congregational/ United Church of Christ *	25 Great Rd.	45.2	45.1	46.7	46.5	46.8
RB-6	The First Parish in Bedford Unitarian Universalist *	75 Great Rd.	47.1	46.0	47.7	47.5	47.8
RB-7	St. Paul's Episcopal Church	100 Pine Hill Rd.	41.6	41.8	43.7	43.5	43.9
RB-8	March for Jesus	54 Summer St.	54.7	52.2	52.4	52.8	53.1
RB-9	Immanuel Baptist Church	400 Great Rd.	47.1	45.8	46.8	47.0	47.3
SB-1	Davis School	Davis Rd.	42.5	43.1	45.0	45.0	45.2
SB-2	Bedford High School **	9 Mudge Way	44.6	45.1	46.4	46.4	46.5
SB-3	John Glenn Middle School	99 McMahon Rd.	45.9	46.7	47.6	47.6	47.8
<p>Notes:</p> <p>1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 <i>ESPR</i>.</p> <p>2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Old Bedford Center Historic District.</p> <p>Source: HMMH 2018</p>							

Table 7-27 Table 7-27 presents the DNL at the noise analysis locations in Concord for 2005, 2012, 2017 and the projected DNL for 2025 and 2035. Examination of the results yields the following conclusions:

- ⇒ Two sites in Concord, NC-18 and NC-19, were at or above 55 dB DNL in 2017.
- ⇒ In 2017, some sites increased in DNL, while others decreased relative to 2012.
- ⇒ All sites are forecast to be at or above 2017 DNL levels in 2025 and 2035.
- ⇒ Two sites, NC-18 and NC-19, are forecast to be at or above 55 dB DNL in 2025 and 2035.

Table 7-27 DNL at Noise Analysis Locations in Concord (dB)

Label ¹	Name ²	Address (Concord)	DNL				
			2005	2012	2017	2025	2035
NC-1	Barrett Farm Historic District†	Barrett's Mill Rd.	46.6	43.5	44.8	45.5	45.9
NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd.	50.3	47.4	48.1	48.9	49.4
NC-3	Joseph Hosmer House	572 Main St.	45.0	44.3	45.4	45.9	46.3
NC-4	Thoreau-Alcott House	255 Main St.	47.9	46.1	46.9	47.6	48.0
NC-5	Hubbardville Historic District†	324-374 Sudbury Rd.	49.2	46.5	47.3	48.0	48.4
NC-6	Hubbard-French Historic District	324-374 Sudbury Rd.	49.2	46.5	47.3	48.0	48.4
NC-7	Deacon Thomas Hubbard/ Judge Henry French House	342 Sudbury Rd.	49.0	46.4	47.2	47.9	48.3
NC-8	Pest House	158 Fairhaven Rd.	49.9	46.3	47.1	47.8	48.2
NC-9	Main Street Historic District†	Main St. between Monument Sq. and Wood St.	50.8	48.0	48.3	49.1	49.5
NC-10	North Bridge-Monument Square Historic District†	Monument St., Liberty St. and Lowell St.	50.5	48.2	48.4	49.2	49.6
NC-11	Wright Tavern	Lexington Rd. & Main St.	51.0	48.2	48.4	49.2	49.6
NC-12	Sleepy Hollow Cemetery	24 Court Ln.	52.2	49.0	49.0	49.9	50.4
NC-13	American Mile Historic District†	Lexington Rd.	51.7	48.5	48.6	49.5	49.9

Label ¹	Name ²	Address (Concord)	DNL				
			2005	2012	2017	2025	2035
NC-14	Concord Monument Square-Lexington Road Historic District	Monument Sq. and Lexington Rd.	50.9	48.1	48.3	49.1	49.6
NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike	52.9	49.1	49.1	49.9	50.4
NC-16	Walden Pond	MA Rte 126 (Main Beach)	45.8	43.4	46.2	46.2	46.6
NC-17	Orchard House	399 Lexington Rd.	53.8	50.2	50.0	50.8	51.3
NC-18	Deacon John Wheeler/ Capt. Jonas Minot Farmhouse	341 Virginia Rd.	60.4	58.4	57.8	58.6	59.0
NC-19	Wheeler-Meriam House	477 Virginia Rd.	59.9	58.1	57.7	58.4	58.8
NC-20	Concord Armory-Concord Veteran's Building	51 Walden St.	-	48.1	48.3	49.1	49.6
NC-21	Concord School of Philosophy	391 Lexington Rd.	-	50.3	50.1	51.0	51.4
NC-22	Hosmer Homestead	138 Baker Ave.	-	41.6	43.1	43.5	43.8
PC-1	Library **	129 Main St.	49.4	47.1	47.6	48.4	48.8
PC-2	Town Hall ++	22 Monument Sq.	50.8	48.1	48.3	49.1	49.6
PC-3	Middlesex County Court House	305 Walden St.	52.4	48.4	48.6	49.4	49.8
RC-1	Trinity Episcopal Church **	81 Elm St.	46.0	45.0	46.0	46.6	47.0
RC-2	Redeemer Presbyterian Church	191 Sudbury Rd.	49.0	46.7	47.4	48.1	48.5
RC-3	New Life Community Church (meeting at the Emerson School Building **)	40 Stow St.	50.0	47.4	47.8	48.6	49.0
RC-4	Trinitarian Congregational Church **	54 Walden St.	50.9	48.0	48.2	49.0	49.5
RC-5	First Church of Christ Scientist++	7 Lowell Rd.	50.2	47.7	48.0	48.8	49.3
RC-6	St. Bernard's Parish++	70 Monument Square	50.5	47.9	48.2	49.0	49.4
RC-7	Christian Science Reading Room	20 Main St.	50.7	47.9	48.2	49.0	49.4

Label ¹	Name ²	Address (Concord)	DNL				
			2005	2012	2017	2025	2035
RC-8	First Parish in Concord ++	20 Lexington Rd.	51.2	48.2	48.4	49.2	49.7
SC-1	Nashoba/Brooks School	200 Strawberry Hill Rd.	49.3	46.5	47.8	48.6	49.1
SC-2	Middlesex School**	1400 Lowell Rd.	41.3	40.4	42.3	42.7	43.0
SC-3	Fenn School **	498-516 Monument St.	53.7	50.9	51.2	51.9	52.4
SC-4	Concord Academy **	166 Main St.	48.6	46.6	47.2	48.0	48.4
SC-5	Alcott School	91 Laurel Rd.	51.8	48.1	48.4	49.2	49.6
SC-6	Concord/Carlisle High School	500 Walden Rd.	50.8	46.8	47.6	48.3	48.7
SC-7	Ripley School	120 Meriam Rd.	56.4	53.6	52.7	53.7	54.3
<p>Notes:</p> <p>1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 <i>ESPR</i>.</p> <p>2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places, and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (++) contribute to the Concord Monument Square-Lexington Road Historic District.</p> <p>Source: HMMH 2018</p>							

Table 7-28 presents the DNL at the noise analysis locations in Lexington for 2005, 2012, 2017 and the projected DNL for 2025 and 2035. Examination of the results yields the following conclusions:

- ⇒ No sites in Lexington were at or above 55 dB DNL in 2017.
- ⇒ In 2017, all sites increased in DNL relative to 2012.
- ⇒ All sites are forecast to be at or above 2017 DNL levels in 2025 and 2035.
- ⇒ One site, NLX-1, is forecast to be at or above 55 dB DNL in 2025 and 2035.

Table 7-28 DNL at Noise Analysis Locations in Lexington (dB)

Label ¹	Name ²	Address (Lexington)	DNL				
			2005	2012	2017	2025	2035
NLX-1	Simonds Tavern	331 Bedford St.	55.5	53.0	54.5	55.3	55.9
NLX-2	Hancock-Clarke Historic District†	Hancock St.	47.0	42.8	42.9	43.5	43.9
NLX-3	Hancock-Clarke House	35 Hancock St.	46.6	42.6	42.9	43.5	43.8
NLX-4	Garrity House	9 Hancock St.	47.1	42.7	42.9	43.5	43.8
NLX-5	Lexington Green Historic District	Mass. Ave., Harrington Rd. and Bedford St.	47.4	42.9	43.1	43.6	44.0
NLX-6	Lexington Green	Mass. Ave., Harrington Rd. and Bedford St.	47.2	42.7	42.9	43.5	43.9
NLX-7	Buckman Tavern	1 Bedford St.	46.9	42.5	42.7	43.2	43.6
NLX-8	General Samuel Chandler House	8 Goodwin Rd.	46.8	42.5	42.7	43.3	43.7
NLX-9	Hancock School	33 Forest St.	47.3	42.6	43.0	43.6	44.0
NLX-10	U.S. Post Office Building	1661 Mass. Ave.	44.9	40.8	41.1	41.7	42.1
NLX-11	Warren E. Shelburne House	11 Percy Rd.	42.0	38.4	39.3	40.0	40.3
NLX-12	Munroe Tavern Historic District†	Mass. Ave.	39.5	36.6	37.9	38.6	39.0
NLX-13	Sanderson House-Munroe Tavern	1314 & 1332 Mass. Ave.	40.7	37.4	38.5	39.2	39.6
NLX-14	John Mason House	1303 Mass. Ave.	41.0	37.7	38.7	39.4	39.8
NLX-15	East Village Historical District†	Mass Ave.	37.7	35.3	37.4	38.2	38.6
NLX-16	M.H. Merriam and Company	7-9 Oakland Ave.	-	41.6	41.9	42.4	42.8
OLX-1	Battle Green Historic District**	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave. and B&M Railroad	47.2	42.8	42.9	43.5	43.9
OLX-2	National Heritage Museum	33 Marrett Rd.	39.2	36.2	38.1	38.9	39.3
PLX-1	Library **	1874 Mass. Ave.	47.7	43.1	43.3	43.8	44.2

Label ¹	Name ²	Address (Lexington)	DNL				
			2005	2012	2017	2025	2035
PLX-2	Town Hall **	1625 Mass. Ave.	42.9	39.3	39.8	40.4	40.8
PLX-3	Lexington School District Administration **	1557 Massachusetts Ave.	43.9	40.0	40.4	41.0	41.4
RLX-1	Lexington United Methodist Church/ St. John's Korean United Methodist Church ³	2600 Massachusetts Ave.	48.1	45.9	47.4	48.1	48.5
RLX-2	Temple Isaiah	55 Lincoln St.	48.5	44.2	45.6	46.2	46.7
RLX-3	Grace Chapel of Lexington	59 Worthen Rd.	49.3	44.6	44.8	45.4	45.8
RLX-4	St. Brigid's Parish *	2001 Mass. Ave.	48.7	44.0	44.2	44.8	45.2
RLX-5	First Parish-Unitarian Church ⁺⁺	7 Harrington Rd.	47.8	43.2	43.4	43.9	44.3
RLX-6	Hancock United Church of Christ ⁺⁺	1912 Mass. Ave.	47.5	43.0	43.2	43.7	44.1
RLX-7	Church of Our Redeemer	6 Meriam St.	46.7	42.3	42.5	43.1	43.5
RLX-8	Christian Science Reading Room	10 Muzzy St. #12	46.3	41.8	42.1	42.7	43.1
RLX-9	Greek Orthodox Church of St. Nichols **	17 Meriam St.	46.1	42.0	42.2	42.8	43.1
RLX-10	Chabad Center **	9 Burlington St.	52.0	49.9	50.9	51.7	52.2
RLX-11	Pilgrim Congregational Church	55 Coolidge Ave.	48.0	44.9	45.8	46.5	46.9
RLX-12	First Baptist Church of Lexington **	1580 Mass. Ave.	44.0	40.1	40.5	41.1	41.5
RLX-13	Jehovah's Witnesses	196 Woburn St.	38.1	36.7	38.3	39.0	39.4
RLX-14	Follen Church Society-Unitarian Universalists *	755 Massachusetts Ave.	35.6	34.0	37.4	38.2	38.6
RLX-15	Countryside Bible Chapel	480 Lowell St.	39.2	37.3	40.2	41.1	41.5
RLX-16	St. Paul Evangelical Church	451 Lowell St.	37.4	36.2	39.2	40.1	40.4
SLX-1	Minuteman Regional Vocational High School	758 Marrett Rd.	45.9	44.8	45.5	45.9	46.3
SLX-2	Maria Hastings School	2618 Mass. Ave.	47.8	45.4	47.1	47.8	48.2
SLX-3	Methodist Weekday School	2600 Massachusetts Ave.	48.1	46.0	47.5	48.1	48.5

Label ¹	Name ²	Address (Lexington)	DNL				
			2005	2012	2017	2025	2035
SLX-4	Community Nursery School	2325 Massachusetts Ave.	48.9	45.8	47.0	47.6	48.1
SLX-5	Bridge Elementary School**	55 Middleby Rd.	47.1	42.2	44.5	45.2	45.8
SLX-6	Lexington High School	251 Waltham St.	46.7	41.7	43.0	43.6	44.0
SLX-7	Jonas Clarke Middle School	17 Stedman Rd.	43.5	37.6	41.9	42.8	43.1
SLX-8	Estabrook School**	117 Grove St.	48.6	44.5	45.7	46.3	46.8
SLX-9	Diamond Middle School	99 Hancock St.	51.5	50.1	51.4	52.2	52.8
SLX-10	Fiske Elementary School	146 Maple St.	44.8	42.4	43.9	44.6	45.0
SLX-11	Armenian Sisters Academy	20 Pelham Rd.	40.7	37.2	38.9	39.6	40.0
SLX-12	Harrington Elementary School	148 Maple St.	34.4	33.5	36.1	36.8	37.2

Notes:

1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 *ESPR*.

2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Lexington Green Historic District.

3. The Lexington United Methodist Church and St. John's Korean United Methodist Church are at the same address.

Source: HMMH 2018

Table 7-29 projected DNL for 2025 and 2035. Examination of the results yields the following conclusions:

- ⇒ No sites in Lincoln were at or above 55 dB DNL in 2017.
- ⇒ In 2017, all sites except SLN-2 increased in DNL relative to 2012.
- ⇒ Some sites are projected to increase in DNL in 2025 and 2035 relative to 2017 and others decrease.

No sites are forecast to be at or above 55 dB DNL in 2025 and 2035.

Table 7-29 DNL at Noise Analysis Locations in Lincoln (dB)

Label ¹	Name ²	Address (Lincoln)	DNL				
			2005	2012	2017	2025	2035
NLN-1	Walden Pond	Rte. 126, Walden St., Concord Rd.	45.9	42.6	46.2	46.2	46.6
NLN-2	Henry Higginson House	44 Baker Farm Rd.	45.1	42.5	46.5	46.1	46.5
NLN-3	Daniel Brooks House	Brooks Rd.	49.5	48.4	51.9	50.8	51.2
NLN-4	Lincoln Center Historic District	Bedford Rd. Lincoln Rd., Old Lexington Rd. Sandy Pond Rd. Trapelo Rd. Weston Rd.	41.0	41.0	43.1	43.2	43.5
NLN-5	Hoar Tavern	268 Cambridge Tpke.	43.0	41.8	44.0	44.5	44.8
SLN-1	Carroll School	25 Baker Bridge Rd.	41.7	40.8	44.3	44.0	44.4
SLN-2	Hanscom Middle School	Hanscom AFB	49.1	50.2	49.9	50.2	50.4
SLN-3	Hanscom Primary School	Hanscom AFB	45.9	42.6	46.2	46.2	46.6

Notes:

1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other categories. The second letter (or second and third) indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 *ESPR*.

2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS.

Source: HMMH 2018

7.8 Minute Man National Historical Park (MMNHP)

In 1991, Congress directed the National Park Service (NPS) to conduct research on the impacts of aircraft overflying the National Park System in Public Law 100-91, the National Parks Overflights Act. The National Park Service issued Director's Order 47 (DO47) "Soundscape Preservation and Noise Management" in December 2000. The purpose of the order is to "articulate National Park Service operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources."

DO47 directs park managers to develop soundscape preservation and noise management plans that are consistent with the individual objectives for the park set forth in the Park General Management Plan. The individual park superintendent is tasked with identifying appropriate

noise levels and criteria, as well as a plan for noise management and soundscape preservation. The NPS completed an internal draft soundscape plan for MMNHP in 2010, including noise monitoring with professional and volunteer staff. Sound monitoring was conducted in 2008-09 at MMNHP by the NPS Natural Sounds Division and is included in the internal draft plan. The scope for the soundscape plan at MMNHP incorporated aspects of approaches that have been used at other NPS properties.

In order to address noise levels at various locations in MMNHP, 31 locations were included in the list of noise analysis locations. These sites were also included in the *2012 ESPR*. Table 7-30 presents the DNL at the noise analysis locations in MMNHP for 2005, 2012, 2017 and the projected DNL for 2025 and 2035.

The table shows that none of these 31 locations fell within the 65 dB or 60 dB DNL contours in 2017 or are projected to fall within these contours in 2025 or 2035. Additionally, no portion of the park fell within the 60 dB or 65 dB DNL contours in 2017 (see Figure 7-10) or is projected to in 2025 or 2035 (see Figure 7-17 and Figure 7-18). None of the Historic Battle Road Interpretive Trail fell within the 55 dB DNL contours in 2017 or is projected to in 2025 or 2035.

Due to the increased use of Runway 5/23 during the closure of Runway 11/29 for repaving in August of 2017, the 55 dB DNL contour did extend into the park in 2017. The area of the park within the 55 dB DNL contour is projected to decrease in 2025 and 2035 relative to the area in 2017. The Noah Brooks Tavern (MM-13) had the highest DNL in 2017 at 55.0 dB and is projected to remain the site with the highest DNL in 2025 and 2035, but below current levels.

Table 7-30 DNL at Noise Analysis Locations in the Minute Man National Historical Park (dB)

Label ¹	Name ²	Unit/Town ³	DNL				
			2005	2012	2017	2025	2035
MM-1	Major John Buttrick House	North Bridge Unit / Concord	51.2	48.7	48.9	49.6	50.1
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	50.5	48.3	48.4	49.1	49.6
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	50.3	48.2	48.3	49.0	49.4
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	49.7	47.9	47.9	48.6	49.1
MM-5	North Bridge	North Bridge Unit / Concord	49.9	48.0	48.1	48.8	49.3

Label ¹	Name ²	Unit/Town ³	DNL				
			2005	2012	2017	2025	2035
MM-6	Old Manse *	North Bridge Unit / Concord	50.2	48.1	48.2	49.0	49.4
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	53.6	50.3	50.1	50.9	51.4
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	51.9	50.3	50.3	50.9	51.3
MM-9	Meriam House	Battle Road Unit / Concord	52.1	50.6	50.5	51.2	51.6
MM-10	Historic Farming Fields	Battle Road Unit / Concord	51.4	50.7	50.9	51.1	51.5
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	50.5	49.2	50.6	50.3	50.6
MM-12	Samuel Brooks House	Battle Road Unit / Concord	52.5	50.8	54.4	53.2	53.6
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	53.4	51.4	55.0	53.6	54.0
MM-14	Job Brooks House	Battle Road Unit / Lincoln	53.0	51.5	54.6	53.3	53.7
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	51.7	50.7	53.6	52.4	52.8
MM-16	Bloody Angle	Battle Road Unit / Lincoln	50.1	50.9	51.7	51.0	51.3
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	47.8	49.2	49.3	49.2	49.4
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	47.1	48.5	48.7	48.7	48.9
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	45.8	47.0	47.6	47.7	48.0
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	45.2	45.8	46.3	46.6	46.8
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	44.5	45.5	46.6	46.8	47.1
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	45.9	46.0	46.3	46.6	46.8
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	47.2	47.0	46.9	47.2	47.4

Label ¹	Name ²	Unit/Town ³	DNL				
			2005	2012	2017	2025	2035
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	47.5	47.1	46.9	47.3	47.5
MM-25	Parkers Revenge	Battle Road Unit / Lexington	47.6	47.0	46.8	47.2	47.5
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	46.9	46.1	46.2	46.6	46.9
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	47.6	46.4	46.5	46.9	47.2
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	47.7	45.9	46.3	46.8	47.2
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	47.7	46.2	46.4	46.8	47.2
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	48.4	46.2	47.6	48.2	48.6
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	-	43.5	44.8	45.5	45.9
Notes: 1. The Minute Man National Historical Park (MMNHP) is a national historic landmark district. All sites are in the National Register of Historic Places. 2. Sites within MMNHP are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places. 3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner. Source: HMMH 2018							

Time Above computations with thresholds of 65 dBA and 55 dBA estimate the length of time during an average day in which people could experience outdoor speech interference or require the use of a raised voice at distances of three to four and ten to 15 feet, respectively. This is relevant to activities such as outdoor interpretive programs within Minute Man National Historical Park. Available research data also suggest that noticeability of aircraft occurs at the point at which aircraft noise equals or exceeds the ambient levels. Given that daytime ambient levels in many areas in the MMNHP range from high-30s to mid-40s dBA, the TA55 data suggest that these are times when park visitors could notice aircraft.

Table 7-31 and Table 7-32 show the Time Above values for the 31 points within MMNHP ranged from one to 11 minutes per day over 65 dBA and 17 to 65 minutes per day over 55 dBA. The higher Time Above values occurred in an area stretching from the western end of the Battle Road Unit at sites near Meriam's Corner to the Sgt. Samuel Hartwell House Site, directly south of the intersection of Runways 11/29 and 5/23. These are the closest sites in the Park to

Hanscom Field's runways, and receive noise from several types of aircraft operations including departures turning south off of Runway 29, aircraft departing Runway 23, and pattern operations on Runway 11/29. Location MM-10, the Historic Farming Fields, had the highest TA55 in 2017 and is projected to have the highest TA55 and TA65 in 2025 and 2035.

The sites in MMNHP are expected to experience TA 65 for the future scenarios, ranging from two to eight minutes for the 2025 scenario and two to nine minutes per day for the 2035 scenario. The highest times above 65 dBA were in the range of eight to nine minutes per day and occurred at the Wayside Unit and in the western end of the Battle Road Unit at sites near Meriam's Corner and in Lincoln near the Brooks Tavern and houses. These are among the closest sites in the Park to Hanscom Field's runways, and receive noise from several types of aircraft operations including departures turning south off of Runway 29, aircraft departing Runway 23, and pattern operations on Runway 11/29. The sites in MMNHP are expected to experience TA 55 for the future scenarios, ranging from 19 to 67 minutes for the 2025 scenario and 21 to 71 minutes per day for the 2035 scenario.

Table 7-31 Time Above 65 dB at Noise Analysis Locations in the Minute Man National Historical Park (minutes)

Label ¹	Name ²	Unit/Town ³	2005	2012	2017	2025	2035
MM-1	Major John Buttrick House	North Bridge Unit / Concord	5.9	3.1	4.2	5.2	5.9
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	5.1	2.8	3.9	4.9	5.5
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	4.9	2.7	3.8	4.8	5.4
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	4.5	2.5	3.4	4.3	4.8
MM-5	North Bridge	North Bridge Unit / Concord	4.7	2.7	3.5	4.5	5.0
MM-6	Old Manse *	North Bridge Unit / Concord	5.1	2.9	3.7	4.8	5.3
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	8.8	5.7	6.3	7.8	8.6
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	8.4	5.7	6.3	7.4	8.1
MM-9	Meriam House	Battle Road Unit / Concord	8.8	6.2	6.7	7.9	8.6
MM-10	Historic Farming Fields	Battle Road Unit / Concord	8.0	7.0	7.9	8.1	8.7

Label ¹	Name ²	Unit/Town ³	2005	2012	2017	2025	2035
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	4.9	4.7	6.9	6.0	6.3
MM-12	Samuel Brooks House	Battle Road Unit / Concord	4.2	6.6	10.5	7.7	8.1
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	4.1	7.3	10.4	7.6	8.0
MM-14	Job Brooks House	Battle Road Unit / Lincoln	4.4	8.0	10.5	7.7	8.0
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	4.0	7.1	9.6	7.0	7.4
MM-16	Bloody Angle	Battle Road Unit / Lincoln	4.2	7.3	8.1	6.5	6.9
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	2.8	4.1	4.9	4.3	4.5
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	2.1	2.9	3.6	3.3	3.4
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	1.2	1.5	2.3	2.4	2.5
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	1.1	1.1	2.0	2.2	2.3
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	0.8	1.0	2.0	2.1	2.2
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	1.4	1.3	2.0	2.1	2.2
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	2.2	1.8	2.2	2.4	2.5
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	2.6	1.9	2.3	2.5	2.6
MM-25	Parkers Revenge	Battle Road Unit / Lexington	2.5	1.9	2.3	2.5	2.6
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	2.2	1.4	2.0	2.2	2.3
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	2.8	1.6	2.2	2.4	2.6
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	2.9	1.5	2.4	2.6	2.8

Label ¹	Name ²	Unit/Town ³	2005	2012	2017	2025	2035
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	2.8	1.6	2.3	2.5	2.6
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	3.6	2.0	3.2	3.4	3.8
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	-	0.7	1.4	1.7	1.9

Notes:

1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner.

Source: HMMH 2018

Table 7-32 Time Above 55 dB at Noise Analysis Locations in the Minute Man National Historical Park (minutes)

Label ¹	Name ²	Unit/Town ³	2005	2012	2017	2025	2035
MM-1	Major John Buttrick House	North Bridge Unit / Concord	38.5	26.6	33.4	39.0	42.6
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit / Concord	35.5	26.1	32.2	37.6	41.2
MM-3	North Bridge Comfort Station	North Bridge Unit / Concord	34.5	25.8	32.0	37.3	40.9
MM-4	The Minuteman (Statue)	North Bridge Unit / Concord	30.1	25.1	31.4	36.6	40.0
MM-5	North Bridge	North Bridge Unit / Concord	31.0	25.8	32.1	37.5	41.0
MM-6	Old Manse *	North Bridge Unit / Concord	30.6	26.3	32.8	38.2	41.7
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit / Concord	43.8	34.4	42.3	46.4	49.9
MM-8	Meriam's Corner Monument	Battle Road Unit / Concord	53.8	47.0	49.6	53.0	56.9
MM-9	Meriam House	Battle Road Unit / Concord	55.6	51.0	51.4	55.1	59.2
MM-10	Historic Farming Fields	Battle Road Unit / Concord	70.8	77.2	65.1	66.8	71.1

Label ¹	Name ²	Unit/Town ³	2005	2012	2017	2025	2035
MM-11	Olive Stow House/Farwell Jones House/Carty Barn	Battle Road Unit / Concord	53.2	57.1	58.3	56.7	59.9
MM-12	Samuel Brooks House	Battle Road Unit / Concord	38.9	52.3	55.3	49.1	51.1
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit / Lincoln	34.8	51.1	52.4	45.9	47.7
MM-14	Job Brooks House	Battle Road Unit / Lincoln	37.0	57.2	54.9	48.4	50.2
MM-15	Joshua Brooks, Jr. House	Battle Road Unit / Lincoln	32.9	53.2	51.5	44.9	46.5
MM-16	Bloody Angle	Battle Road Unit / Lincoln	46.9	84.4	64.0	58.8	60.3
MM-17	Ephraim Hartwell Tavern	Battle Road Unit / Lincoln	42.9	72.5	50.7	48.5	49.4
MM-18	Sgt. Samuel Hartwell House Site	Battle Road Unit / Lincoln	39.4	63.5	44.7	43.0	43.7
MM-19	Captain William Smith House	Battle Road Unit / Lincoln	28.7	45.7	33.3	32.0	32.6
MM-20	Paul Revere Capture Site and Marker	Battle Road Unit / Lincoln	21.0	31.0	24.9	25.0	25.7
MM-21	Mile Three Location (Approximate)	Battle Road Unit / Lincoln	17.7	25.9	22.5	21.6	22.2
MM-22	John Nelson House and Barn	Battle Road Unit / Lincoln	26.5	32.7	25.2	26.1	27.0
MM-23	Josiah Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	36.6	42.6	30.0	31.2	32.4
MM-24	Thomas Nelson, Jr. House Foundation	Battle Road Unit / Lincoln	38.4	43.1	30.1	31.4	32.7
MM-25	Parkers Revenge	Battle Road Unit / Lexington	38.2	41.1	28.7	30.1	31.4
MM-26	Minute Man Visitor Center	Battle Road Unit / Lexington	31.6	31.3	23.9	25.2	26.4
MM-27	Jacob Whittemore House	Battle Road Unit / Lexington	35.3	32.5	24.2	25.7	27.0
MM-28	The Bluff and Monument	Battle Road Unit / Lexington	29.5	24.4	20.3	21.7	23.0

Label ¹	Name ²	Unit/Town ³	2005	2012	2017	2025	2035
MM-29	Mile Four Location (Approximate)	Battle Road Unit / Lexington	34.1	29.7	22.9	24.4	25.7
MM-30	Ebenezer Fiske House Foundation	Battle Road Unit / Lexington	30.7	19.8	18.1	19.5	20.9
MM-31	Col. James Barrett Farm*	Barrett Farm Unit/Concord	-	11.9	16.5	18.8	20.5

Notes:

1. The Minute Man National Historical Park is a national historic landmark district. All sites are in the National Register of Historic Places.
2. Sites within Minute Man National Historical Park are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places.
3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail. MM-21 and MM-29 do not refer to specific historic resources, but provide additional coverage of sites along the Trail. MM-21 is approximately three miles east of Meriam's Corner and MM-29 is approximately four miles east of Meriam's Corner.

Source: HMMH 2018

7.9 Stakeholder Engagement and Beneficial Measures

Massport has a long history of noise abatement at Hanscom Field, dating back to at least 1978, when it introduced measures to minimize noise. These measures were officially adopted as Massport regulations in 1980.⁹⁸ The regulation included restrictions on touch-and-go training activity, as well as a nighttime field use surcharge to discourage operations between 11:00 PM and 7:00 AM. More recently, Massport has implemented measures to monitor and reduce noise in the communities near Hanscom Field. These include guidelines for run-ups and the use of Auxiliary and Ground Power Units, a Noise and Operations Monitoring system, a Fly Friendly program, and membership in Sound Initiative. In 2009, Massport made some adjustments to the touch-and-go flight tracks, which reduced the amount of direct flights over the MMNHP and nearby residences. A brochure describing the changes was jointly released by Massport and the NPS, and is distributed to pilots and the public directly, through Massport's website, and is required training for all tenants who receive airport badges.⁹⁹

7.9.1 Community Meetings

Massport strives to build positive community relations and public confidence by maintaining open communications and by supporting programs that assist in addressing the concerns of Hanscom Field's stakeholders and host communities. Massport staff regularly attends monthly community meetings to inform the public of airport planning and policy developments.

⁹⁸ Part F of the General Rules and Regulations for Laurence G. Hanscom Field Effective July 31, 1980.

⁹⁹ Massport Noise Abatement at Hanscom Field website, accessed at: <https://www.massport.com/hanscom-field/about-hanscom/noise-abatement/>

Massport also sponsors informational meetings with the communities and other interested parties when appropriate. Massport staff regularly attend the monthly meetings of the Hanscom Field Advisory Commission (HFAC) and the Hanscom Area Towns Committee (HATS).

The HFAC was established by the legislature in 1980 to review Massport decisions regarding its goals, policies and plans for the airport. It includes representatives from the aviation and residential communities as well as advisory members who represent MMNHP, Hanscom AFB, the FAA, and Massport. Massport staff members provide HFAC with information regarding Massport's goals, policies and plans for the airport. Additionally, staff members prepare and present monthly aircraft activity and noise reports, capital program and third party development status reports, as well as the annual State of Hanscom report and the Annual Noise Report.

HATS was created to consider matters of common interest to the four towns that are contiguous to Hanscom Field and Hanscom AFB. One select-board member from each town serves on HATS along with planning board representatives and at-large members from the towns. HATS representatives consider regional traffic, planning, land use and other issues. Massport staff members attend the HATS meetings to address Massport-related agenda items, participate in discussions, and respond to questions relating to Hanscom Field and Massport.

7.9.2 Community Contributions

Massport's Charitable Contribution, Scholarship, Summer Internship, and Community Summer Jobs Programs benefit organizations located in communities that host its facilities. The organizations serve a diverse constituency and a variety of worthwhile purposes. In 2017, Massport contributed over \$7,000 to educational, scholarship, and youth programs in the Hanscom area. Additionally, Massport provided approximately \$12,000 to sponsor summer internship positions at various municipal departments in the four Hanscom towns and over \$14,000 for the salaries of local college students that worked directly for Massport.

7.9.3 Run-up Procedures

Massport has a well-defined aircraft engine maintenance run-up procedure for Hanscom Field. Aircraft are directed to the "run-up pad" located due south of Runway 11/29, west of the intersection with Runway 5/23. At the run-up pad, aircraft are directed to maintain a west heading when conducting run-ups; there is a short "blast fence" on the east side of the pad, which deflects jet exhaust, prop wash, and debris. Furthermore, Massport discourages operators from conducting nighttime run-ups.

After Shuttle America began performing regular aircraft maintenance at Hanscom Field, there were times when nighttime run-ups occurred for maintenance purposes. After receiving multiple complaints, mostly from residents in newly constructed homes along Virginia Road, Massport re-located those nighttime run-ups to the east end of the East Ramp, away from this

residential community. Shuttle America has since discontinued service to Hanscom Field, and subsequently there have been no regular nighttime maintenance run-ups at Hanscom.

Massport will continue to direct operators to the run-up pad during the day, and to the East Ramp at night, should extenuating circumstances require such activities. The optimal orientation for run-ups at the East Ramp is a magnetic heading of approximately 230 degrees, aligned with Runway 5/23, whenever feasible based on wind conditions. This heading will minimize sound levels at homes north of the approach end of Runway 11/29, while providing a substantial reduction in sound levels at the more recently constructed homes along Virginia Road (relative to levels during run-ups conducted at the run-up pad). This heading is desirable for use regardless of aircraft type, though jet aircraft are likely to be more sensitive to crosswind conditions and may not be able to use the preferred heading as often as propeller aircraft can.

7.9.4 Auxiliary Power Units and Ground Power Units

Massport has additional ground noise procedures in effect minimizing the use of on-board Auxiliary Power Units (APUs) and Ground Power Units (GPUs). APUs and GPUs provide electricity, heat and air conditioning to an aircraft when its engines are off.

At Hanscom Field, APU and GPU use is prohibited outside of hangars between 11:00 PM and 7:00 AM, unless their use is part of takeoff procedures, or for necessary maintenance procedures. Between 7:00 AM and 11:00 PM, the use of APUs is limited to 30 minutes.

When operationally feasible, the use of GPUs is preferred over APUs. Although the noise levels produced by GPUs are not insignificant, (they are similar to an idling diesel truck), they are considerably lower than the noise levels produced by a typical APU. In addition, GPUs generally are more fuel efficient than APUs and less expensive to run from a maintenance standpoint. Reduction of APU use may also have the benefit of reducing emissions. It should be noted that it is not feasible to completely eliminate APU use, because APUs may be needed to start the aircraft main engines, and maintenance requiring operation of the APU may sometimes need to be performed at locations where alternative power is not readily available.

7.9.5 Field Use Fee

Although the FAA control tower is closed from 11:00 PM to 7:00 AM, Hanscom Field is a public facility and is open for use 24 hours a day. In the summer of 1980, an 11:00 PM to 7:00 AM "nighttime field use fee" surcharge was instituted to discourage the use of the field between 11:00 PM and 7:00 AM. The fee is based on aircraft weight and doubles for aircraft that conduct more than five night operations in a calendar year. In 1980 the surcharge were \$20 for aircraft weighing 12,500 pounds or fewer and \$150 for aircraft weighing more than 12,500 pounds.

In 1989, the Massport Board voted to increase the surcharge to reflect the Consumer Price Index (CPI) increase between 1980 and 1989 and to institute an annual CPI increase, effective each July 1. This schedule coincides with Massport's fiscal years, which run from July 1 to June

30 annually. As a result, the surcharges were \$59 and \$428 for the first six months of 2017, and \$60 and \$438 for the second half of 2017.

Some operations are exempted from the fee. The overwhelming majority of exemptions are medical flights, which are dominated by the medical evacuation service Boston MedFlight based at Hanscom Field. Exemptions also included military, FAA, and Civil Air Patrol operations, as well as Hanscom Field based aircraft that used the airport between 11 p.m. and 7 a.m. due to unavoidable circumstances, such as weather, mechanical, or FAA delays.

7.9.6 Noise and Operations Monitoring System

Massport's original Noise and Operations Monitoring System (NOMS) was installed in 1989. It included six permanent noise monitors near Hanscom Field. In 2004, Massport selected

Hanscom Airport Activity Monitor website includes:

- ⇒ Complaint entry;
- ⇒ Near-real-time¹ and historical aircraft flight tracks; and
- ⇒ Customized reports for any time period for DNL, hourly Leq, and noise events at the permanent noise monitors.

Note¹: Flight track data is delayed by ten minutes for security purposes.

Rannoch Corporation, now Harris Corporation, to replace the system's microphones and software. The replacement NOMS incorporates state-of-the-art capabilities that have improved the accuracy, efficiency, usefulness, reliability, and user-friendliness of the system.

Hanscom staff members began experiencing the benefits of the new system in 2007, and have been able to provide callers with more information about disturbing flights than was available in the past. An interactive website has been developed for public use.¹⁰⁰ Data from the system are shared with the communities on a

monthly basis at the HFAC meetings. The NOMS is continuously improved to increase the accuracy and usefulness of the data as well as ease of use.

7.9.7 Fly Friendly Program

Although Massport began supporting the use of the National Business Aviation Association's (NBAA's) noise abatement procedures for jet aircraft in the mid-1980s, the Fly Friendly program at Hanscom Field provided an opportunity to broaden such efforts. Massport expanded its support of quiet arrival and departure techniques by publicizing the Aircraft Owners and Pilot Association's (AOPA's) noise abatement procedures for piston aircraft and by developing and publicizing quiet flying procedures for helicopters. Part of this effort included the development of a multi-faceted publicity program that results in pilots being exposed and re-exposed to the importance and understanding of the quiet-flying techniques, as follows:

¹⁰⁰ <http://www.massport.com/hanscom-field/about-hanscom/airport-activity-monitor/>

- ⇒ Handouts outlining the procedures are distributed at the FBOs, the flight schools, and in Massport's Hanscom Field offices.
- ⇒ Framed posters describing noise abatement procedures are located in the flight schools' offices, Massport's offices, and the fixed base operators' facilities.
- ⇒ Videos describing the techniques for both jet and piston aircraft are incorporated into the training required to qualify for a Hanscom Field security badge.
- ⇒ Descriptions of these quiet flying procedures are posted on Massport's website.
- ⇒ Signage on the airfield provides a last minute reminder to departing pilots to use quiet flying techniques.

7.9.8 Touch and Go Program

In late 2009, Massport staff began using flight track data created by the new noise monitoring system to identify potential opportunities for reducing touch-and-go traffic over the Hartwell Tavern area in the Minute Man National Historical Park. Massport also initiated communications with the FAA and the Hanscom Field flight schools to identify practical recommendations and help create an implementation program. By working together, touch-and-go patterns for each runway were devised to safely increase the number of flights that fly over the airport, which inherently minimizes aircraft noise for the park's visitors. An aggressive publicity program was implemented, including the display of framed posters, mailings, and meetings with pilots and flight instructors, as well as local press coverage.

Massport staff has since continued to work with local pilots and the FAA to reduce the number of flights over the MMNHP. Flight track data is reported quarterly. Results of the touch and go program are shared with pilots, certified flight instructors, the FAA and MMNHP staff. Massport also communicates MMNHP special events to local pilots and encourages the flying community to review Hanscom's Fly Friendly recommendations. The result is an average of 22% fewer flights over the Park since the inception of the program in 2009.

7.9.9 Sound Initiative

Massport was an active participant in Sound Initiative, a coalition that supported the federal phase out of Stage 2 aircraft weighing less than 75,000 pounds. Stage 2 aircraft were manufactured before today's stringent noise standards were adopted for new airplanes. The use of Stage 2 aircraft weighing over 75,000 pounds was phased out nationally by 2000, but most of Hanscom Field's jets weigh less than 75,000 pounds. In 2012, Congress passed the FAA Modernization and Reform Act, which included the phase out of all non-stage 3 aircraft by December 31, 2015. Section 506 of the Act prohibits the operation, within the 48 contiguous states, of jets weighing 75,000 pounds or less that do not comply with Stage 3 noise levels. Military aircraft are exempt from the Stage 3 Rule.

8

Air Quality



This chapter of the 2017 ESPR describes air quality and air emissions in the study area from aircraft activity and from motor vehicles accessing the airport. The 2025 and 2035 growth scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions, described in Chapter 3 Airport Activity Levels.

This chapter provides background information on regulations addressing air quality at the state and federal levels, and includes a summary of the current state of FAA research into a replacement for leaded aviation fuel. Carbon monoxide, nitrogen oxides, volatile organic compounds, lead, sulfur dioxide and particulate matter emissions from aircraft operations,

ground support equipment, stationary sources (such as generators) and vehicular traffic are described and quantified. Current emissions levels are compared to those described in prior ESPRs, as well as future forecasted levels in 2025 and 2035.

Massport has a sustainability and resiliency plan, which includes the preparation of Greenhouse Gas (GHG) emissions inventories from their facilities and operations. This document includes the first GHG emissions inventory for Hanscom Field, which will be used as a baseline to track changes over time.

8.1 Air Quality Key Findings

Massport calculated 2017 annual emissions of criteria pollutants from aircraft operations at Hanscom Field and from motor vehicles accessing the airport. These were compared to the emissions data for 1985, 1995, 2000, 2005 and 2012, which were published in the *2012 ESPR*. Results of the analysis demonstrate that emissions associated with Hanscom Field activity continue to represent a very small fraction of regional emissions.

The forecasted emission levels from Hanscom Field for the future scenarios are not anticipated to result in adverse air quality effects. For all scenarios, air quality concentrations in Bedford, Concord, Lexington, Lincoln, Minute Man National Historical Park (MMNHP), and Great Meadows National Wildlife Refuge (GMNWR) will be in compliance with the Massachusetts and National Ambient Air Quality Standards. Key findings from this chapter include:

- ⇒ Aircraft emissions for all pollutants except carbon monoxide (CO) and nitrogen oxides (NO_x) decreased between 2012 and 2017.
- ⇒ While overall operations were lower in 2017 than in 2012, which resulted in fewer emissions for most pollutants, emissions levels for CO and NO_x increased. These increases are due primarily to modeling differences between the Federal Aviation Administration's [FAA] Aviation Environmental Design Tool [AEDT] and the Emissions and Dispersion Modeling System (EDMS). AEDT is now required and has replaced EDMS, which was used for prior ESPRs.
- ⇒ Emissions of pollutants forecasted for 2025 and 2035 presented in the *2017 ESPR* are below those forecasted for 2020 and 2030 in the *2012 ESPR*.
- ⇒ For the first time, Massport has added an estimate of Greenhouse Gas (GHG) to the Hanscom Field emissions inventory. While the MEPA regulations require GHG analyses for projects, consistent with the Logan ESPR/EDR process, Massport has agreed to add an airport-wide GHG inventory to the Hanscom ESPR process. This initial inventory will serve as a baseline for future ESPR analyses.

Air quality in the region currently meets all National and Massachusetts Ambient Air Quality Standards (NAAQS & MAAQS) set by the U.S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection.

- ⇒ NAAQS / MAAQS are set for six criteria pollutants to protect human health and welfare. Criteria pollutants include:
 - Carbon monoxide (CO);
 - Lead (Pb);
 - Nitrogen dioxide (NO₂);
 - Ozone (O₃);
 - Particulate matter (PM), and;
 - Sulfur dioxide (SO₂).
- ⇒ The region is forecasted to be in attainment for all pollutants in both future year scenarios (2025 and 2035).
- ⇒ Aircraft emissions decreased for Pb, O₃, PM and SO₂ between 2012 and 2017, and increased for CO and NO₂.

- ⇒ Aircraft emissions of criteria pollutants and greenhouse gases (GHG) for each of the future year scenarios (2025 and 2035) are forecasted to be higher than those for the year 2017 based on a predicted growth in operations. The exception is emissions of CO for 2025 and 2035, which show a slight decrease compared to 2017 due to changes in fleet mix. Specifically, forecasts for 2025 and 2035 (as described in Chapter 3 Airport Activity Levels) indicate a growth in jet aircraft operations and a reduction in single engine piston aircraft operations compared to 2017. Jet engines emit less CO than piston engines, which accounts for the estimated reduction in CO despite a forecasted growth in overall operations for 2025 and 2035.
- ⇒ These estimates are conservative because the air quality model does not assume any improvements in engine performance and efficiency over time.
- ⇒ Ground transportation emissions of all criteria pollutants are expected to decrease in the future year scenarios due to more efficient vehicles which will offset the increase in vehicle miles traveled.

8.1.1 Changes Since 2012

The Greater Boston area, including Hanscom Field communities, is currently in attainment with all National Ambient Air Quality Standards (NAAQS) and Massachusetts Ambient Air Quality Standards (MAAQS), established by the U.S. Environmental Protection Agency (EPA). Areas that are “in attainment” are determined by the EPA to meet applicable air quality standards (i.e. the concentration of specific air emissions is below the level required to protect human health and welfare). As reported in the *2012 ESPR*, the Greater Boston area was at the time designated as in non-attainment for the 1997 8-hour ozone (O₃) NAAQS (i.e. measured concentrations of O₃ exceeded those set by the EPA as necessary to protect public health and welfare). Figure 8-1 provides definitions of air quality designations under the NAAQS.

The 1997 O₃ standard was updated and replaced by a new O₃ standard in 2015. In September 2016, Massachusetts recommended to EPA that all areas in the Commonwealth be designated as in attainment of the 2015 standards, based on 2013-2016 monitoring data. In a response dated November 2017, EPA designated all counties in Massachusetts as in attainment for the 2015 O₃ standards, including Middlesex County and its surrounding counties.¹⁰¹

The Massachusetts Department of Environmental Protection (MassDEP) air monitoring data for the Greater Boston area were analyzed for the *2017 ESPR* to evaluate air quality trends in the region for 10 to 20 years (varies by type of air pollutant) prior to and including 2017. As with prior ESPRs, Massport utilized MassDEP air quality monitoring data from Kenmore Square and Chelmsford monitoring locations to determine air quality levels for the current year and to compare those levels with air quality levels in the past. Historical air quality monitoring data from MassDEP reveal that air quality in the Greater Boston area has improved substantially

¹⁰¹ U.S. EPA. December 2017. *Letter from Deborah A Szaro, EPA Acting Regional Administrator, to Massachusetts Governor Charles Baker.* <https://www.epa.gov/sites/production/files/2017-12/documents/ma-epa-resp-ozone.pdf>

during this period, including improvements since the *2012 ESPR*. The Kenmore Square and Chelmsford monitoring locations were selected to ensure the monitoring data is conservative (i.e. levels are higher) than concentrations in Hanscom Field area communities (discussed further in Section 8.3).¹⁰²

Aircraft emissions of four of the six criteria pollutants (sulfur dioxide, ozone, lead, and particulate matter) decreased from 2012 to 2017 primarily due to a reduction in operations. Emissions of the remaining two criteria pollutants, CO and NO_x (represented by nitrogen dioxide, or NO₂) increased. These increases are largely attributable to modeling differences between EDMS (used for the *2012 ESPR*) and AEDT, which was used for the *2017 ESPR* (as per current FAA requirements). Criteria pollutants are described in Section 8.2 and Table 8-1.

Roadway emissions estimates for all pollutants at Hanscom declined between 2012 and 2017 due to a variety of factors, including:

- ⇒ Lower traffic volumes;
- ⇒ The use of an updated and more accurate EPA mobile source emission model to estimate motor vehicle emissions;
- ⇒ The effects of more stringent vehicle emissions inspection and maintenance regulations;
- ⇒ Phasing out of older, less efficient vehicles.

8.1.2 Emissions Model Updates

The *2017 ESPR* used FAA's AEDT to model air emissions from aircraft operations at Hanscom Field. Prior *ESPRs* used FAA's EDMS. While the models are similar in some ways, AEDT includes more precise flight paths and weather models, and more current airframe and engine data. These improvements result in more accurate estimates of fuel burn and emissions.¹⁰³ These changes can cause some differences in emissions estimates. For example, as noted in the preceding section, while there were fewer operations at Hanscom Field in 2017 than in 2012, estimated levels of CO and NO₂ increased. This increase is primarily attributed to methodology differences between AEDT and EDMS. More discussion on the differences between AEDT and EDMS is included in Appendix E and on FAA's AEDT website.¹⁰⁴

¹⁰² MassDEP. 1997-2017. MassDEP Annual Air Quality Reports. <https://www.mass.gov/lists/massdep-air-monitoring-plans-reports-studies>

¹⁰³ Federal Aviation Administration, 2016. *AEDT & Legacy Tools Comparison*. June, 2016. Accessed at: https://aedt.faa.gov/Documents/Comparison_AEDT_Legacy_Summary.pdf

¹⁰⁴ <https://aedt.faa.gov/>

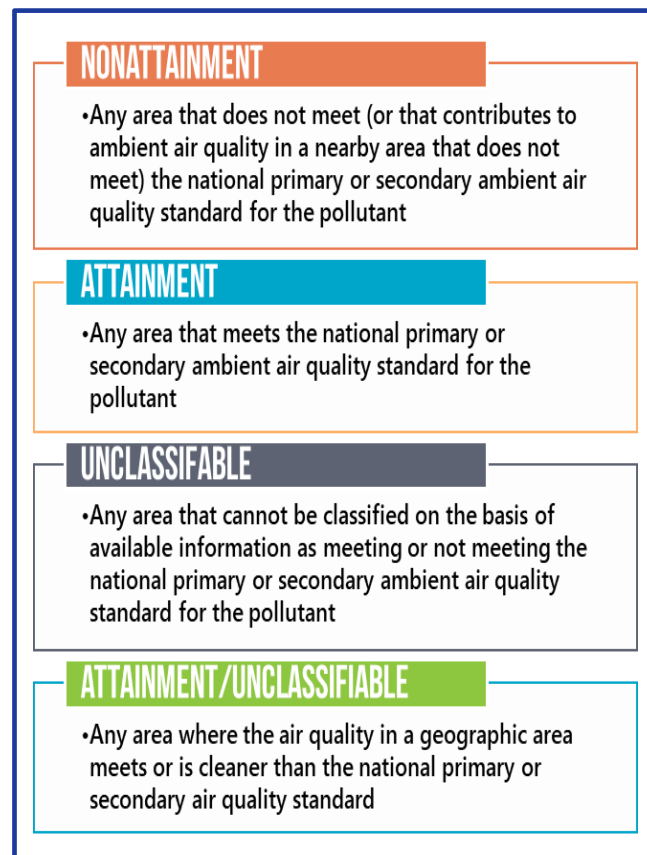
8.2 Regulatory Background

The U.S. Clean Air Act (CAA) requires EPA to set, review, and periodically update the NAAQS for six common air pollutants, called criteria air pollutants: carbon monoxide (CO); lead (Pb); nitrogen dioxide (NO₂); ozone (O₃); particulate matter (PM); and sulfur dioxide (SO₂).

The EPA sets NAAQS at levels intended to protect public health and the environment, and designates all areas of the country as either in attainment (in compliance), or nonattainment areas (not in compliance) regarding the standards.¹⁰⁵ Areas without sufficient air quality monitoring data to make a determination of attainment are designated as unclassifiable. States are required to develop State Implementation Plans (SIPs) to meet and maintain air quality standards, working with EPA to set timeframes and milestones for compliance. Figure 8-1 depicts this process.¹⁰⁶

MassDEP is the designated state agency for the implementation of the SIP. MassDEP is responsible for monitoring outdoor air quality in the state as well as developing plans and regulatory programs to reduce emissions of pollutants that adversely affect public health, welfare, and the environment. MassDEP ensures compliance with the Massachusetts Clean Air Act (MCAA) and its associated MAAQS for criteria pollutants in addition to the federal air quality regulations. The MAAQS are state level air quality standards, which vary from federal standards in some cases for both acceptable levels and methodology to determine compliance (see Table 8-1). The relationship between the federal and

Figure 8-1 Clean Air Act (CAA) Designations for NAAQS



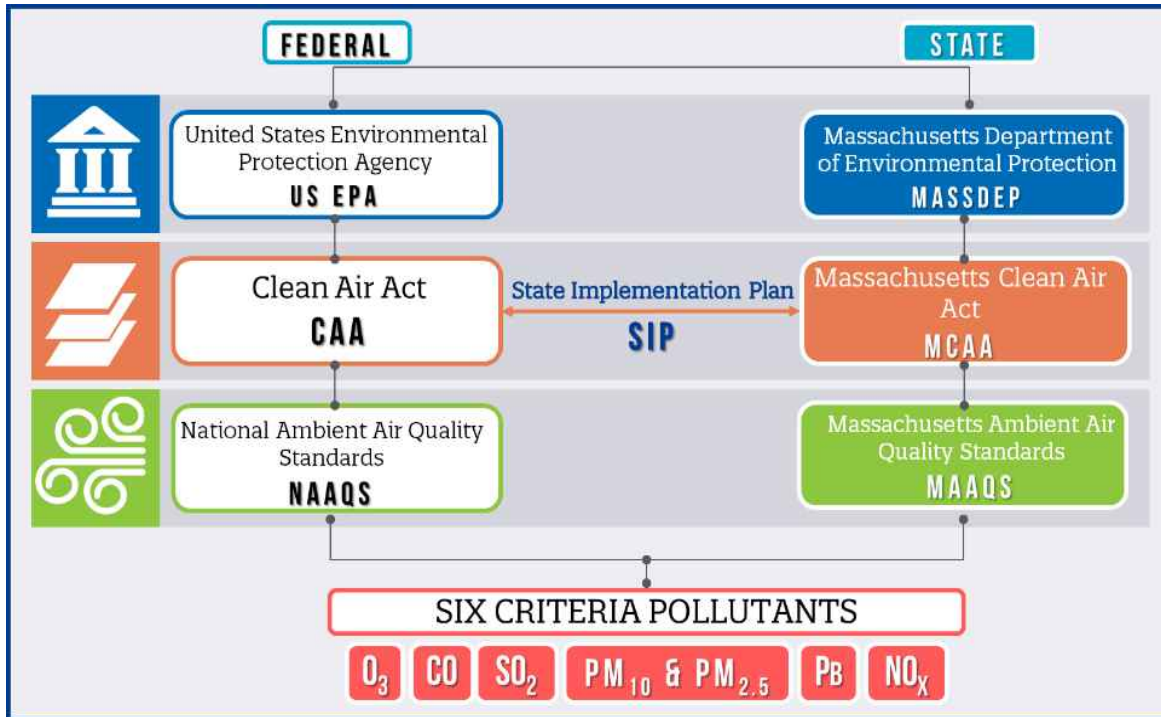
Sources: 42 U.S.C. §§ 7401 §107(d)

¹⁰⁵ The NAAQS include primary standards designed to protect public health, including the most vulnerable populations, and secondary standards, intended to protect public welfare (i.e. visibility, animals, crops, vegetation and buildings).

¹⁰⁶ U.S. EPA. February 2018. *NAAQS Implementation Process*. <https://www.epa.gov/criteria-air-pollutants/naqs-implementation-process>

state air quality regulations is shown in Figure 8-2. Associated air quality regulations, plans, and policies are discussed throughout the remainder of this section.

Figure 8-2 Relationship Between Federal and State Air Quality Regulations



8.2.1 Criteria Air Pollutant Definition and Air Quality Standards

The six criteria pollutants listed above are subject to monitoring at the federal level under the CAA, through the NAAQS, as well as at the state level through MCAA and MAAQS under the SIP for Massachusetts.

The Hanscom Field sources of SO_2 , O_3 , CO , and NO_2 include aircraft, vehicles, ground support equipment (GSE), stationary sources (such as generators), and construction activity. Fuel storage and transfer is a source of both NO_2 and volatile organic compounds (VOCs), which are precursors to O_3 .

Carbon monoxide (CO)

CO is a colorless, odorless, and tasteless gas. It may temporarily accumulate, especially in cool, calm weather conditions, when fuel use reaches a peak, because CO is chemically most stable in low temperatures. CO from natural sources usually dissipates quickly, posing no threat to human health. Transportation sources (e.g., motor vehicles), energy generation, and open burning are among the predominant man-made sources of CO.

Lead (Pb)

Lead in the atmosphere is generated from industrial sources including waste oil and solid waste incineration, iron and steel production, lead smelting, and battery and lead manufacturing. The lead content of motor vehicle emissions, which was the major source of air-borne lead in the past, has significantly declined with the widespread use of unleaded fuel. Low-lead fuel used in some general aviation (GA) aircraft is still a source of airport-related lead in the atmosphere. Lead emissions can enter the body through inhalation or be ingested via plants, water or soil.

The most recent lead NAAQS were set in 2008, when the EPA revised the prior NAAQS following a finding that serious health effects occur at much lower levels of lead in the blood stream than previously identified.¹⁰⁷ Periodic strengthening of the standard is intended to protect public health, specifically protecting at-risk groups in the population, including children.

The EPA is also currently conducting an analysis, including modeling and monitoring, to evaluate whether lead emissions from avgas could cause or contribute to air pollution that endangers public health and welfare (also called an “endangerment finding”) which could lead to additional regulations in the future. More information on the current status of lead research is included in Appendix E.

Nitrogen dioxide (NO₂)

Nitric oxide (NO), nitrogen dioxide (NO₂), and the nitrate radical (NO₃) are collectively called oxides of nitrogen (NO_x). These three compounds are interrelated, often changing from one form to another in chemical reactions, and NO₂ is the compound commonly measured for comparison to the NAAQS. NO_x is generally emitted in the form of NO, which is oxidized to NO₂. The principal man-made source of NO_x is fuel combustion in motor vehicles and power plants – aircraft engines are also a source. Reactions of NO_x with other atmospheric chemicals can lead to formation of ozone (O₃) and acidic precipitation.

The state’s 1-hour value for NO₂ of 320 µg/m³ is a MassDEP policy guideline (not a regulatory standard) that is only applicable to major stationary sources emitting over 250 tons per year of NO₂. Although it is not applicable to Hanscom Field in a regulatory sense (as Hanscom Field is not considered a stationary source), Massport has used the guideline value in previous airport air quality assessments, and it is included in the 2017 *ESPR* for consistency. It should be noted that the federal 1-hour value for NO₂ of 100 µg/m³ is applicable to Hanscom Field, and was considered in the modeling of future conditions in 2025 and 2035.

¹⁰⁷ Since then, the EPA has reviewed the lead NAAQS and in 2016 issued a determination confirming that the 2008 NAAQS will be retained. See “Review of the National Ambient Air Quality Standards for Lead”. Federal Register 81-201 (October 18, 2016), page 71906. Available from Government Publishing Office at www.govinfo.gov

Oxygen (O₃)

O₃ is a secondary pollutant, formed from daytime reactions of NO_x and volatile organic compounds (VOCs) in the presence of sunlight. VOCs, which are a subset of hydrocarbons (HC) and have no NAAQS, are released in industrial processes and from evaporation of gasoline and solvents. Sources of NO_x are discussed above.

Ground-level (Tropospheric) O₃ and Stratospheric O₃ (in the upper atmosphere) are the same chemical compound, just found at different places in the atmosphere. Stratospheric O₃ at greater than 30,000 feet above the surface of the earth is beneficial to all life because it filters out the sun's harmful UV radiation before it reaches the earth's surface. However, ground-Level O₃ is a health and environmental problem. The discussion of O₃ in this report pertains exclusively to ground-level O₃.

Particulate Matter (PM)

Particulate matter comprises very small particles of dirt, dust, or soot, or liquid droplets called aerosols. The NAAQS for PM are segregated by size (i.e., less than 10 microns and less than 2.5 microns are designated as PM₁₀ and PM_{2.5}, respectively). PM is formed as an exhaust product in an internal combustion engine or can be generated from the breakdown and dispersion of other solid materials (e.g., fugitive dust).

Sulfur dioxide (SO₂)

SO₂ is emitted in natural processes and by man-made sources such as combustion of sulfur-containing fuels and sulfuric acid manufacturing. Sulfur oxides (SO_x) are primarily composed of SO₂. The national and state standards are summarized in Table 8-1. Concentration units for the standards are given in parts per million (ppm) and micrograms of pollutant per cubic meter of air (µg/m³). Since 2012, the national standards have remained unchanged, except for ozone.¹⁰⁸

¹⁰⁸ The EPA has strengthened the 8-hour ozone standard to 0.070 ppm.

Table 8-1 National (NAAQS) and Massachusetts (MAAQs) Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS (Primary Standards)	NAAQS (Secondary Standards)	MAAQs Standard
CO	8-Hour ¹	9 ppm (10 µg/m ³)	None	9 ppm (10 µg/m ³)
	1-Hour ¹	35 ppm (40 µg/m ³)	None	35 ppm (40 mg/m ³)
Lead	Rolling 3-Month Average	0.15 µg/m ³	Same as Primary	1.5 µg/m ³
NO ₂	Annual	0.053 ppm (100 µg/m ³)	Same as Primary	100 µg/m ³
	1-Hour ²	0.1 ppm (188 µg/m ³)	None	320 µg/m ³
Ozone	8-Hour (1997 Standard) (Revoked) ⁸	0.08 ppm	Same as Primary	None
	8-Hour ⁶ (2008 Standard)	0.075 ppm	Same as Primary	None
	8-Hour (2015 Standard) ⁹	0.070 ppm	Same as Primary	None
	1-Hour ⁷	None	None	235 µg/m ³ (0.12 ppm)
PM ₁₀	Annual ³	None	None	50 µg/m ³
	24-Hour ¹	150 µg/m ³	Same as Primary	150 µg/m ³
PM _{2.5}	Annual ⁴	12 µg/m ³	15 µg/m ³	None
	24-Hour ⁵	35 µg/m ³	Same as Primary	None
SO ₂	Annual	None	None	80 µg/m ³
	24-Hour ¹	None	None	365 µg/m ³
	3-Hour ¹	None	0.5 ppm (1,300 µg/m ³)	0.5 ppm (1,300 µg/m ³)
	1-Hour	75 ppb (196 µg/m ³)	None	None

Notes:

1. Not to be exceeded more than once a year.
 2. MassDEP NO₂ Policy Guideline level not to be exceeded more than one day per year.
 3. The annual PM₁₀ standard was revoked nationwide in 2006.
 4. Three-year average of annual PM_{2.5} arithmetic means.
 5. Three-year average of 98th percentile 24-hour PM_{2.5} concentrations.
 6. Three-year average of annual 4th highest daily maximum 8-hour ozone concentration.
 7. The 1-hour ozone standard was revoked for most areas nationwide in 2012. <https://www.gpo.gov/fdsys/pkg/FR-2012-05-29/pdf/2012-12505.pdf#page=1>
 8. The 1997 8-hour ozone standard was revoked in 2012. <https://www.gpo.gov/fdsys/pkg/FR-2012-05-29/pdf/2012-12505.pdf#page=1>
 9. The 2015 8-hour ozone standard was lowered in 2015 to 0.070 ppm. Standard based on the annual fourth-highest daily maximum concentration averaged over 3 years.
- Source: 40 CFR 50, 310 CMR 6.0

8.2.2 Non-criteria Pollutant Emissions

Non-criteria pollutants do not have NAAQS, but can contribute to the formation of ozone and particulate matter and/or be toxic. The non-criteria pollutants monitored by MassDEP include Total Suspended Particulates (TSP), and air toxics, which include certain VOCs, a precursor to ozone, and toxic metals.

Other emissions that occur as a result of aviation activity and vehicular operations are described below.

Ultrafine Particulate Matter

Ultrafine particles (UFP) are defined as airborne particles with diameters of less than 0.1 microns.¹⁰⁹ Some primary sources of UFP are combustion processes associated with burning wood or fuel or associated with industrial manufacturing processes. UFPs also occur naturally in the environment from sand or dust.¹¹⁰ For example, in the region surrounding Hanscom Field, aircraft emissions are just one of many potential sources contributing to UFP concentrations. Other contributors include but are not limited to motor vehicle exhaust and generators.

To date, there are no EPA or MassDEP air quality regulations that exist for UFP due to limited health studies to substantiate an air quality standard, however the EPA has begun to consider developing a standard for UFPs on the basis of unique physical attributes and potential human health hazards. The agency is currently reviewing existing NAAQS for PM₁₀ and PM_{2.5}, which provides an opportunity to include UFPs; a determination is due by 2022. While studies are ongoing to examine the health impacts of UFP exposure, the results may not be sufficient or clear enough to develop a standard. Appendix E contains additional information about relevant ongoing and recently completed air quality studies that include consideration of UFPs.

Black Carbon

While particulate matter at all sizes is comprised of multiple components, one of the more significant components is Black Carbon (BC). BC particles, also referred to as soot, form as a result of incomplete combustion, particularly at the higher temperatures at which aircraft burn fuel. Therefore, BC emissions are common from aircraft. According to EPA, BC is associated with respiratory distress, cardiovascular disease, cancer and birth defects. The FAA conducts research on BC through a program called ASCENT, the agency's Center of Excellence for research on aviation environmental topics. To fully understand the extent of impacts from airport related BC emissions, more research is needed.

¹⁰⁹ Health Effects Institute. January 2013. *Understanding the Health Effects of Ambient Ultrafine Particles*.

<http://pubs.healtheffects.org/getfile.php?u=893>

¹¹⁰ ACI Europe. 2012. *Ultrafine Particles at Airports*. <http://dit.cph.dk/wp-content/uploads/2015/06/ACI-study-on-ultrafine-particles-at-airports.pdf>

8.2.3 Climate Change and Greenhouse Gas Emissions

As defined by the EPA, climate change refers to “significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer”.¹¹¹ These changes have both natural and man-made causes, and the latter are the result of increasing atmospheric concentrations of carbon dioxide (CO₂), methane (CH₄), nitrogen dioxide (NO₂) and other GHGs. Human activities that produce these gases include energy production and transportation activities, and have resulted in unprecedented warming of the Earth’s surface.¹¹²

In 2009, the EPA issued a finding that GHGs also contribute to air pollution that may endanger public health or welfare, referred to as the “Endangerment Finding”.¹¹³ This finding laid the groundwork for regulation of GHGs under the CAA, however there are no current federal laws regulating GHG emissions from airports.¹¹⁴ The EPA has established a Greenhouse Gas Reporting Program, which requires certain entities directly emitting more than 25,000 metric tons (MT) of CO₂ equivalent annually to report their emissions.¹¹⁵

Massachusetts acknowledges climate change as an important environmental and economic issue, and has taken a number of actions designed to address both the Commonwealth’s contribution to climate change as well as preparing for the anticipated effects of climate change. For example, Governor Baker issued Executive Order 569 in 2016 to establish a climate change strategy.¹¹⁶ State regulatory actions addressing climate change are described in Appendix E. Massport also acknowledges climate change as an important environmental and economic issue, and has published their most recent Annual Sustainability and Resiliency Report in 2018 (see Chapter 11 for details). The report outlines how Massport is preparing its infrastructure to be more resilient, and efforts taken to reduce GHG emissions from Massport facilities and operations.

The first GHG emissions inventory for Hanscom Field is a component of this *2017 ESPR*, using 2017 as a baseline year. Section 8.5 presents this inventory.

¹¹¹ Environmental Protection Agency definition of climate change. Available at: https://19january2017snapshot.epa.gov/climatechange/climate-change-basic-information_.html

¹¹² IPCC 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer]. IPCC, Geneva, Switzerland.

¹¹³ https://www.epa.gov/sites/production/files/2016-08/documents/federal_register-epa-hq-oar-2009-0171-dec.15-09.pdf

¹¹⁴ The EPA is in the process of developing CO₂ emission standards for aircraft engines.

¹¹⁵ Total carbon dioxide equivalent, or CO₂e, is calculated by applying the Global Warming Potential (GWP) values for each type of GHG in order to convert each to its equivalent mass in CO₂.

¹¹⁶ Massachusetts Executive Order 659: Establishing an Integrated Climate Change Strategy for the Commonwealth. September 16, 2016. <https://www.mass.gov/executive-orders/no-569-establishing-an-integrated-climate-change-strategy-for-the-commonwealth>

8.2.4 Federal and State Mobile Source Emissions Standards and Regulations

Both the EPA and Massachusetts have enacted various vehicle emissions standards and measures to improve air quality and reduce airborne pollutant emissions from mobile sources.

The Corporate Average Fuel Economy (CAFE) standards were enacted in 1975 with the intention of improving the average fuel economy of passenger cars and light trucks, and decreasing national fuel consumption. Today, the standards set fleet-wide average fuel economy requirements for automakers manufacturing passenger cars and light trucks, as well as medium and heavy-duty vehicles. The standards are regulated by the National Highway Traffic Safety Administration (NHTSA) and supported by EPA GHG standards.¹¹⁷

MassDEP has enacted various vehicle emissions and fuel standards designed to improve air quality and reduce airborne pollutant emissions from mobile sources, such as the enhanced Motor Vehicle Emissions Inspection and Maintenance (I/M) Program. The program requires vehicles to pass an annual emissions test if they have an onboard diagnostic system and were manufactured after model year 2002.¹¹⁸ The Commonwealth of Massachusetts has also adopted other state programs to reduce emissions from mobile sources, including the California Low Emissions Vehicle program (LEV) and the California Zero Emissions Vehicle program (ZEV). See Appendix E for details on these regulations.

These regulations and standards are intended to further reduce mobile source emissions while increasing the prevalence of alternative fuel vehicles such as hybrid, electric, and biodiesel vehicles in the fleet mix. Alternative fuel vehicles are more efficient, resulting much lower emissions, compared to conventional gasoline and diesel vehicles. As these vehicles replace older, less efficient vehicles, emissions are expected to decrease.

The Multi State Zero Emission Vehicle (ZEV) Action plan is governed by the following initiatives:

- ⇒ Increase consumer awareness and confidence in ZEVs;
- ⇒ Make ZEV more affordable and provide incentives; and
- ⇒ Support the development of electric charging and hydrogen fueling infrastructure.

Reformulated Gasoline and Vapor Recovery Systems

Massachusetts has adopted the federal regulations for reformulated gasoline, although it is not a required area under the Clean Air Act. Reformulated gasoline (RFG) is designed to

¹¹⁷ U.S. Department of Transportation. August 2014. *Corporate Average Fuel Economy (CAFE) Standards*. <https://www.transportation.gov/mission/sustainability/corporate-average-fuel-economy-cafe-standards>

¹¹⁸ Mass.gov. *Basic Inspection Information*. <https://www.mavehiclecheck.com/motorists-basicinfo>

produce lower emissions of toxic substances from evaporation and to burn cleaner than conventional gasoline, resulting in improved air quality and less smog-forming pollutants.

Massport does not own or operate fuel distribution facilities at Hanscom Field. A survey of fixed based operators (FBOs) at Hanscom Field found that vapor recovery is being used on all fuel storage tanks subject to MassDEP regulation and that Stage II vapor controls are used at all gasoline-dispensing facilities.

8.3 Year 2017 Existing Conditions

The sections that follow provide climate data and discuss ambient air quality standards, and present air quality data related to the Hanscom Field region. Air quality in Bedford, Concord, Lexington, and Lincoln is very good and in compliance with all existing NAAQS as classified by the EPA.¹¹⁹ Ozone levels remain in compliance with the new 8-hour standard and no violations were detected at the nearby Chelmsford monitoring location. Ozone concentrations in by end of Eastern Massachusetts are greatly affected by air pollution transported from the New York/New Jersey/Connecticut metropolitan area, and these changes are likely influenced by conditions to the west.

8.3.1 Climate

The climate for Hanscom Field is determined in part by its proximity to the Atlantic Ocean. The airport is located 16 miles inland at an elevation of approximately 130 feet above mean sea level. Wind patterns at Hanscom Field are different from those in Boston, including a greater occurrence of calm winds, which are characteristic of inland locations. On a large scale, Hanscom Field is subject to the rapid weather changes typical to southern New England. The largest storms move up the east coast of the United States from the Carolinas and in most cases pass to the south and east of the area, resulting in northeast and easterly winds with rain, snow, and fog. Annual winds are predominantly from the west, with winter winds from the northwest and summer winds from the southwest. Figure 8-3 presents a windrose for Hanscom

¹¹⁹ Title 40 Code of Federal Regulations Part 81, Section 81.322 – Massachusetts. <https://www.govinfo.gov/content/pkg/CFR-2018-title40-vol20/pdf/CFR-2018-title40-vol20-sec81-322.pdf>

Field, depicting a five-year climatological average of hourly measurements taken at the airport from 2012 to 2016 by MassDEP.

Determinant factors for climate include:

- ⇒ **Wind Direction:** Determines where emissions will travel during dilution and dispersion in the atmosphere.
- ⇒ **Wind Speed:** Determines the dilution rate, with higher speeds resulting in greater dilution and lower air pollutant concentrations.
- ⇒ **Atmospheric Stability:** Determines the rate at which pollutants released near the ground are mixed and dispersed in the atmosphere, with a neutral to unstable atmosphere providing rapid dispersion and a stable atmosphere providing slower dispersion. Atmospheric instability is caused by the difference in temperature between a parcel of air and the surrounding atmosphere. Warmer air masses are less dense than the surrounding cooler atmosphere, and thus the warmer air parcel will rise. Stable conditions occur when there is less differential in temperature between an air parcel and the surrounding atmosphere – for example, at night when there is no solar heating of the ground to produce thermal air turbulence.

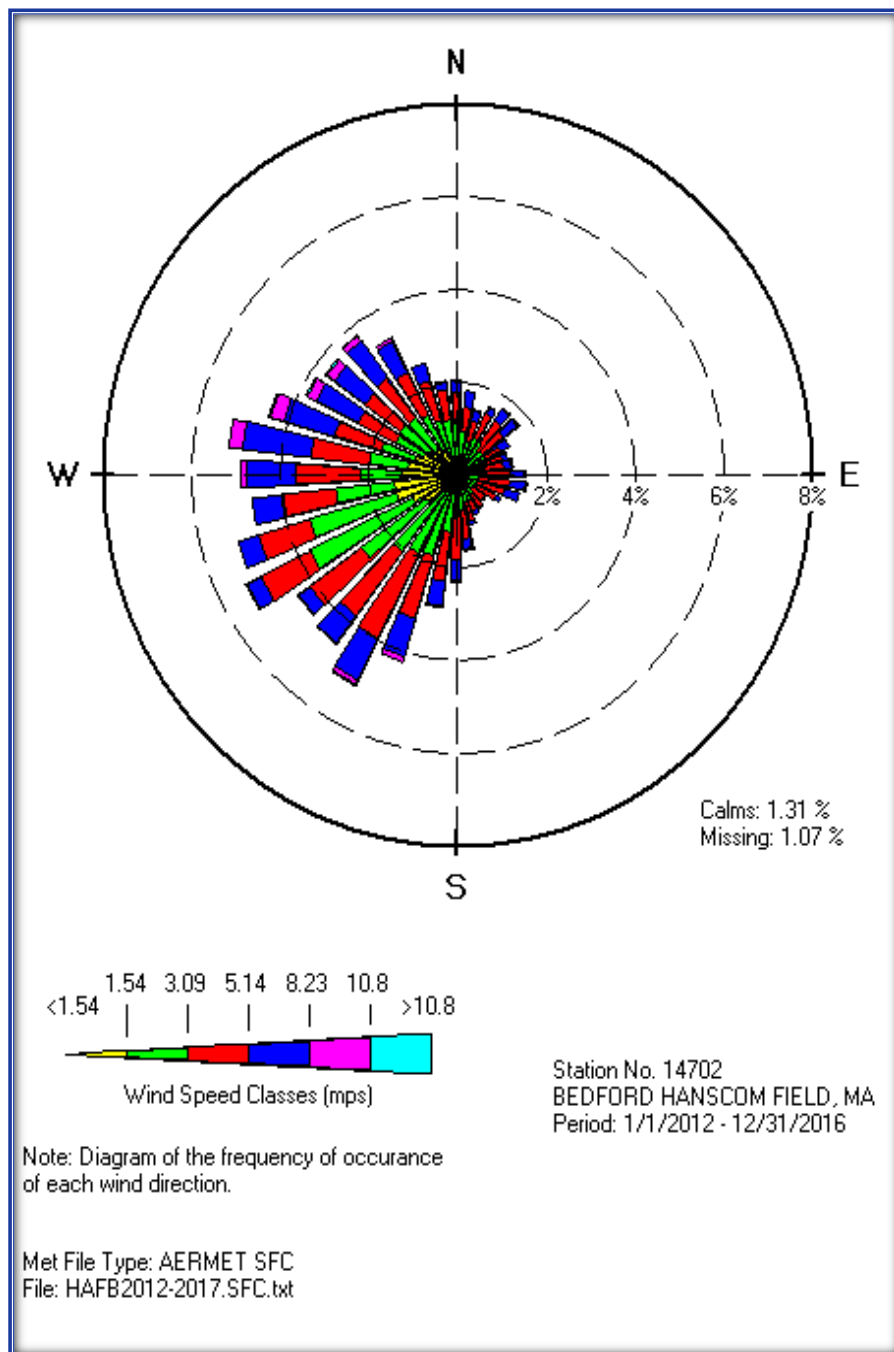
8.3.2 Background Air Quality Data Sources

Following EPA guidance,¹²⁰ background concentrations of pollutants are determined using monitoring data from regional state monitoring sites (collected over a year of continuous measurements). Because there are no MassDEP monitoring stations in the four Hanscom Field communities, MassDEP stations in the Greater Boston area that have historically had the highest pollution levels and the longest historical records were selected to represent the Hanscom Field communities. These stations (Kenmore Square in Boston, Harrison Avenue in Boston, and Chelmsford) are located in more urban areas than the Hanscom Field communities and therefore result in estimates that are more conservative (i.e. higher pollutant concentrations) than the immediate Hanscom Field area. This approach was approved by both the MassDEP and the Secretary of Energy and Environmental Affairs as part of the scoping process for this *2017 ESPR*.

For the purposes of the *2017 ESPR*, the existing background air quality concentrations are added to the calculated Hanscom Field effects to form total concentrations for comparison with air quality standards. Historical records from the same monitoring stations are used to provide a perspective on how air quality in the region today compares with that in the recent past.

¹²⁰ Title 40 Code of Federal Regulations Part 51, Appendix W – Guideline on Air Quality Models. December 20, 2016.
<https://www.gpo.gov/fdsys/pkg/CFR-2017-title40-vol2/xml/CFR-2017-title40-vol2-part51.xml>

Figure 8-3 Annual Frequency of Wind Speed, Direction and Atmospheric Stability Observed at Hanscom Field



Source: MassDEP AERMOD Surface Meteorological Files, Station #14702, Hanscom Field, Bedford, Mass., (2012-2016).

The Massachusetts Environmental Policy Act (MEPA) requires the confirmation of the appropriateness of the data used for background levels in the ESPR air quality analysis. Since the preparation of the *1995 Generic Environmental Impact Report (GEIR)*, Massport has worked with MassDEP Division of Air Quality Control to ensure that the selected monitoring data was appropriate for the Hanscom Field communities. MassDEP determined that the selected monitoring data were both conservative and acceptable for use in the *1995 GEIR*.¹²¹ Since the background data are chosen to be conservatively elevated, their use in forming total predicted concentrations, which are then compared to air quality standards, serves to protect public health with an added margin of safety.

Site-specific monitoring for NO₂ was performed for the *1995 GEIR* to test the accuracy of the analysis. This monitoring was not performed to establish background levels in the Hanscom Field communities. Its purpose was to test and confirm the assumption that MassDEP's monitoring data from Boston represented conservative estimates of local Hanscom Field community air quality. The monitoring data demonstrated that NO₂ concentrations close to the airport were safely in compliance with the air quality standard and well below those measured by MassDEP at Kenmore Square in Boston. Thus, the Kenmore Square data were shown to be conservative, and the MassDEP did not recommend additional air quality monitoring be performed for subsequent ESPRs.¹²² The air quality analysis for this *2017 ESPR* is consistent with this approach approved by MassDEP for the *2000*, *2005* and *2012 ESPR* documents.

Table 8-2 presents the background level data for the six criteria pollutants (CO, NO₂, SO₂, PM₁₀/PM_{2.5}, lead, and ozone). MassDEP does not perform VOC monitoring on a regular basis because there is no state or national air quality standard for VOC. While MassDEP has undertaken some special VOC monitoring programs in the past, these were limited in their scope and duration and are not applicable to the Hanscom Field communities. Similarly, CO₂ is not a regulated air pollutant under the NAAQS and therefore it is not included in the MassDEP data. Although there are no background level data for VOCs, later sections of this chapter include year 2017 VOC emission inventories from Hanscom Field aircraft operations and motor vehicle traffic.

The data in Table 8-2 for CO, NO₂, PM₁₀, and PM_{2.5}, are from the Kenmore Square monitoring station. All lead data as well as 2016 and 2017 CO and 2017 PM₁₀ come from the Harrison Avenue Monitor in Boston.¹²³ Data for ozone are from the Chelmsford monitor.

There are no ambient lead monitors at or near Hanscom Field; however MassDEP actively monitors lead at its Harrison Avenue site in Boston. A review of lead monitoring data from the Harrison Avenue location shows that lead levels are well below the national lead standard of 0.15 µg/m³.

¹²¹ Personal communication, Mr. Charles Mentos, MassDEP Division of Air Quality Control, Boston, July 9 and 30, 1996.

¹²² Refer to the *2017 ESPR* Scope Certificate in Appendix B.

¹²³ MassDEP. Air Monitoring Plans, Reports & Studies. (<http://www.mass.gov/eea/agencies/massdep/air/quality/air-monitoring-reports-and-studies.html>).

For all pollutants except ozone the selected monitor is in the City of Boston, where emission densities are higher than in the Hanscom Field communities. Ozone is not directly emitted from any source, and tends to have higher concentrations downwind of large urban areas. Hanscom Field air quality assessments over the past three decades have used ozone data from monitoring stations in the nearby towns of Sudbury, Stow, and Chelmsford.¹²⁴ An air quality monitoring station near Hanscom Field, operated by the EPA at their Lexington laboratory from 1991 to 1993, measured ozone and recorded levels approximately 10 percent below those in Sudbury/Stow. No violations of the ozone standard were ever recorded at the Lexington monitoring site near Hanscom Field.

Table 8-2 Background Air Quality Levels (µg/m³) at Monitoring Locations

Pollutant ¹	Averaging Time	Levels ⁴ Measured In:			Background Selected
		2015	2016	2017	
CO ²	8-Hour	344	1,370	1,375	1,375
	1-Hour	344	2,750	1,490	2,750
Lead ²	Monthly	0.016	0.017	0.000	0.017
NO ₂	Annual	33	28	48	48
	1-Hour	105	88	87	105
Ozone ³	8-hour	0.061	0.070	0.065	0.070
PM ₁₀	Annual	14	14	11	14
	24-Hour	30	30	27	30
PM _{2.5}	Annual	6.5	6.2	6.1	6.5
	24-Hour	15.0	13.0	12.0	15.0
SO ₂	1-hour	14.0	11.0	7.3	14.0
	Annual	1.4	1.1	1.3	1.4

Note:

1. Data for many pollutants come from Kenmore Square, Boston, exceptions are noted below. Concentrations for 1-hour, 8-hour and 24-hour averages are annual second-highest values, except for 1-hour NO₂ and 24-hour average PM_{2.5} which are 98th percentile values. Selected PM_{2.5} background values are the three-year averages. For all other pollutants, the selected background values are the highest of the value measured in the three-year period.
2. The 2016 and 2017 CO monitor values were collected at Harrison Avenue as well as the 2017 PM₁₀ and all lead values.
3. The Ozone values were collected at Chelmsford. Ozone values are presented in PPM consistent with the standard.
4. Levels above 10 micrograms/m³ are rounded to the nearest whole number.

Source: Massachusetts DEP Air Monitoring Reports (<http://www.mass.gov/eea/agencies/massdep/air/quality/air-monitoring-reports-and-studies.html>)

¹²⁴ These are the closest ozone monitoring stations to Hanscom Field. The Massachusetts DEP discontinued ozone monitoring at the Sudbury location after 1998, and commenced monitoring at the Stow location in 1998 which was discontinued in 2011. Monitoring commenced in 2012 at the EPA Chelmsford location.

8.3.3 Summary of Background Conditions

Since the 2012 *ESPR*, the Greater Boston area has been in attainment for all criteria pollutants except ozone. However the area was designated as in attainment for ozone after the EPA promulgated a new ozone standard in 2015 (strengthening it to 0.070 ppm). EPA designated Middlesex County and the surrounding counties as in attainment/unclassifiable for the 2015 ozone standards in November of 2017.¹²⁵ In 2017, there were 12 days when the 8-hour ozone standards of 0.070 ppm were exceeded in Massachusetts; however, there were no monitors in the Hanscom area that violated the 0.070 ppm standards. While ozone concentrations have trended downward over the past several decades due to air pollution control programs, ozone concentrations vary each year due to weather patterns.¹²⁶ Figure 8-4 displays the 1-hour and 8-hour ozone levels in Middlesex County for the last twenty years.

Since the 2012 *ESPR*, the Greater Boston area has had "clean air" (i.e., no violations of the air quality standards for these pollutants):

- ⇒ PM₁₀, NO₂, SO₂ and Lead (Pb) – For over 25 years;
- ⇒ CO – For over 20 years;
- ⇒ PM_{2.5} – Since 1999 when monitoring for this pollutant commenced;
- ⇒ O₃ (Ozone) – With the new 2015 Ozone standard, Massachusetts was designated as in attainment/unclassifiable.

Using actual air quality measurements collected throughout the region by the MassDEP over the last 25 years, the following progress has been documented:

- ⇒ CO levels in the Greater Boston area have steadily declined since their peak in the 1970s. The entire state, including the Hanscom Field area has been considered in attainment with the CO standard since April 2002.
- ⇒ In January of 2010, EPA established a new 1-hour NO₂ standard of 100 ppb. In January of 2012, EPA designated all of Massachusetts as in attainment with the new NO₂ standard.
- ⇒ In June of 2010, EPA established a new 1-hour SO₂ standard of 75 ppb along with new monitoring requirements that began in January of 2013. In December of 2017, EPA designated all of Massachusetts as in attainment for the 1-hour standard. All six monitors in the Commonwealth show levels that meet the new 1-hour standard.
- ⇒ In 2006, the EPA revoked the annual PM₁₀ standard. There have been no violations of the PM₁₀ air quality standard recorded in the Hanscom area.

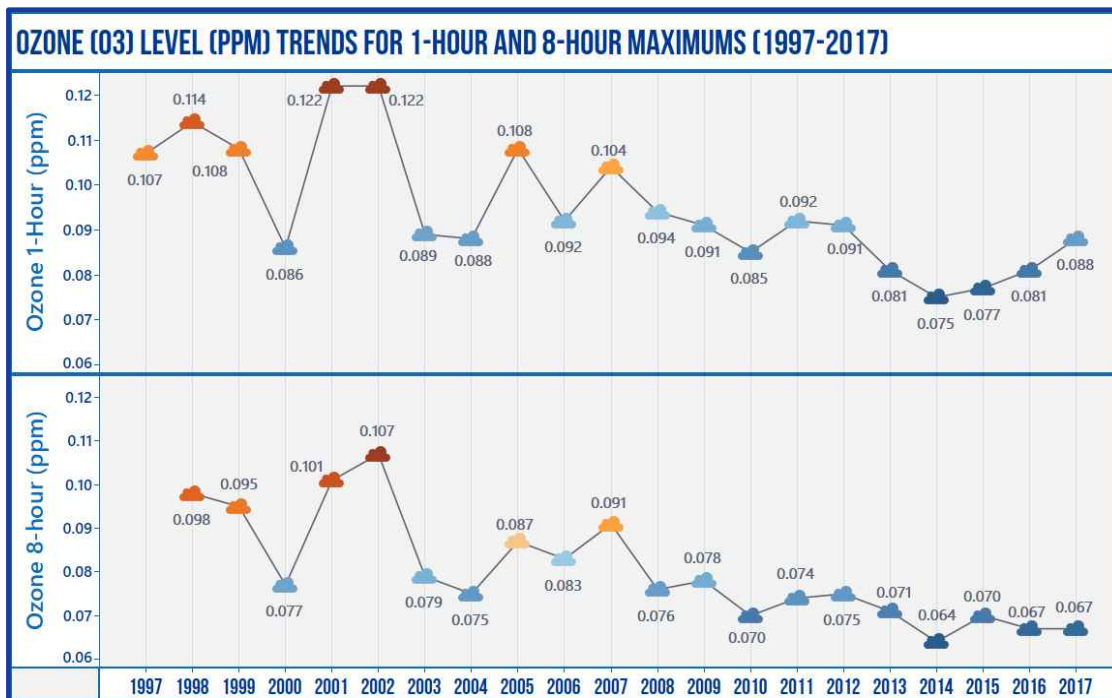
¹²⁵ <https://www.gpo.gov/fdsys/pkg/FR-2017-11-16/pdf/2017-24640.pdf>

¹²⁶ <https://www.mass.gov/files/documents/2018/10/09/17aqrpt.pdf>

- ⇒ In December of 2014, EPA designated all of Massachusetts as unclassifiable/attainment with the 2012 PM_{2.5} standard. No violations of the PM_{2.5} air quality standard have been recorded in the Hanscom area.
- ⇒ Lead levels in the air have declined significantly since the early 1980s mostly due to the removal of lead in gasoline. In October of 2008, the EPA tightened the lead standard from 1.5 µg/m³ to 0.15 µg/m³, averaged over a 3-month period. No violations of the lead air quality standard have ever been recorded in the Greater Boston area.

The current ozone standards were set in 2015. No violations of the 2015 standard have occurred in the Middlesex County area since they were set, and EPA designated Middlesex County as attainment/unclassifiable with the 2015 ozone standards (see Figure 8-4).

Figure 8-4 Middlesex County Ozone Level (PPM) Trends for 1-hour and 8-hour Maximums (1997-2017)



Notes: ¹O₃ measurements are taken from Middlesex County monitor locations: 1997-2012 values are from US MILITARY RES monitor in Stow, MA, 2012-present values from 11 TECHNOLOGY monitor Chelmsford, MA

²O₃ 8-hour data became available in 1998

³Blue icons in the figure represent years in which the O₃ levels met the standard; orange and red icons indicate an exceedance.

Source: MassDEP, 1997-2017, Annual Air Quality Reports.

8.4 Hanscom Field Emissions

This section and the next provide estimates of total annual air emissions generated by activities associated with Hanscom Field for the year 2017 and for the forecast scenarios. The primary sources of air pollution at Hanscom Field are aircraft operations and groundside roadway traffic. Other sources include space heating emissions and fugitive emissions from fuel storage, fuel spillage, and aircraft refueling activities. Prior studies have shown that emissions from these latter sources are very small compared to aircraft emissions and groundside roadway traffic emissions, so they are excluded.

Annual aircraft emissions were calculated for the year 2017 at Hanscom Field. Pollutants associated with aircraft engines are CO, NO_x, PM₁₀, PM_{2.5}, CO₂, and VOCs. The methodology for calculating the aircraft emissions is outlined below. For reference, the complete list of NAAQS and MAAQS levels for the pollutants are listed earlier in this chapter in Table 8-1.

The five specific operating modes in a Landing/Take-off (LTO) cycle are:

- 6) Approach from 3,000 feet;
- 7) Taxi/idle-in;
- 8) Taxi/idle-out;
- 9) Takeoff; and
- 10) Climb out to 3,000 feet.

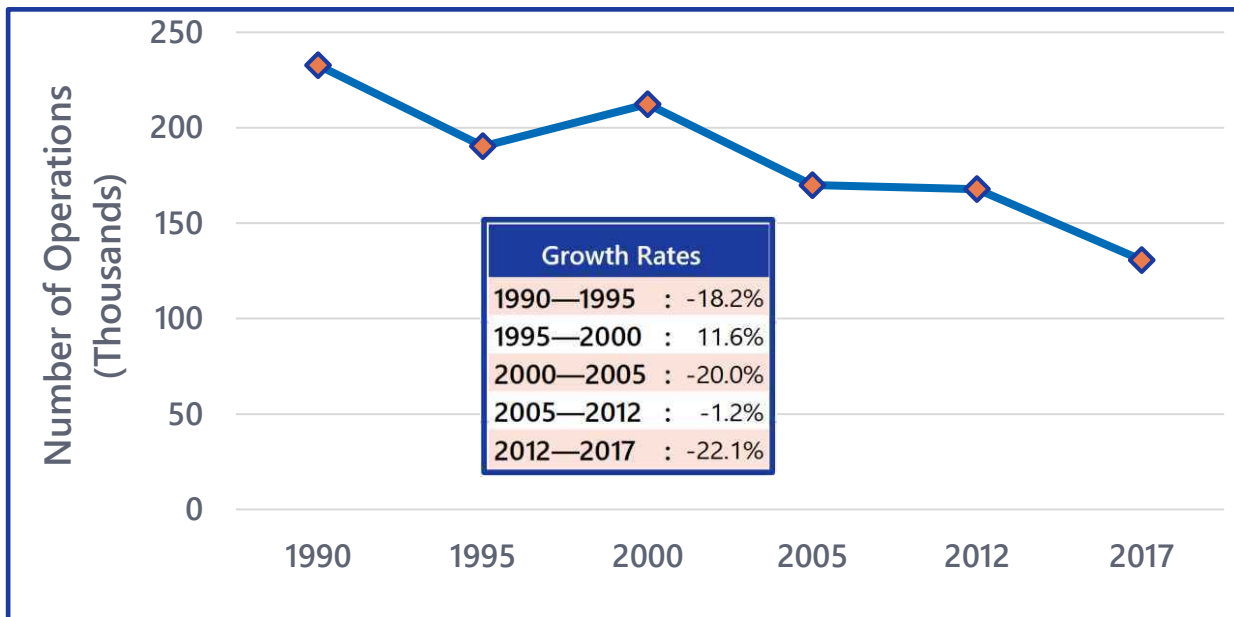
According to the EPA, an airport emissions inventory should concentrate on the emission characteristics of aircraft relative to the vertical column of air around and above the airport that ultimately affects ground level pollutant concentrations.¹²⁷ This portion of the atmosphere, which begins at the earth's surface and extends upward 3,000 feet, is simulated in air quality models, and is often referred to as the mixing zone. The aircraft operations of interest within this column are defined as the landing and takeoff (LTO) cycle. The cycle begins when the aircraft approaches the airport on its descent from cruising altitude, lands, and taxis to the gate. It continues as the aircraft taxis back out to the runway for subsequent takeoff and climb out as it heads back up to cruising altitude.

Actual numbers of aircraft operations at Hanscom Field for the years 1990, 1995, 2000, 2005, 2012 and 2017 are described in detail in Chapter 3 Airport Activity Levels, and relative levels are shown below in Figure 8-5 for reference. The data show that the number of aircraft operations at Hanscom Field in 2017 decreased by 22 percent compared to the 2012 total. The annual aircraft operations data used for the air quality analysis were consistent with the operations presented in the noise analysis (See Chapter 7 Noise). To convert the aircraft operations for use in the FAA's Aviation Environmental Design Tool (AEDT), the Integrated Noise Model (INM) type for each aircraft from the noise analysis was assigned an aircraft and engine type using the databases provided within AEDT (See tables D-1 through D-3 in Appendix D). Annual emissions were calculated by multiplying the number of operations for

¹²⁷U.S. EPA, Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, Office of Air and Radiation, EPA-450/4-81-026d (Revised), 1992.

each AEDT aircraft/engine classification by the emission factor for that classification for each mode of the LTO cycle.

Figure 8-5 Aircraft Operations at Hanscom Field Over Time



8.4.1 Analysis of 2017 Conditions

Year 2017 Aircraft Emissions

The aircraft emission factors for CO, NO_x, PM₁₀, PM_{2.5}, CO₂, and VOCs used to calculate the annual aircraft emissions at Hanscom Field in the 2017 *ESPR* were taken from the FAA AEDT model (Version 2d). For previous *ESPR* documents, annual emission inventories were developed using the FAA's EDMS. As of May 2015, FAA requires the use of AEDT to compile air emissions inventories from aircraft operations. The AEDT model is a combined noise and air quality model designed to evaluate environmental impacts from aircraft activities. To model air quality, AEDT has the ability to calculate air quality impacts, pollutant emissions and fuel burn. For the 2017 *ESPR*, AEDT was used to estimate air quality pollutant emissions from aircraft operations at Hanscom (with the exception of CO₂, which was based on the Airport Cooperative Research Program [ACRP] Report 11 guidance consistent with the GHG inventory presented in Section 8.5 of this chapter).¹²⁸

¹²⁸ ACRP Report 11 can be accessed at: <https://www.nap.edu/catalog/14225/guidebook-on-preparing-airport-greenhouse-gas-emissions-inventories>

Aircraft emissions calculated using AEDT for 2017 are shown in Table 8-3 and are compared to the aircraft emissions data published in previous ESPRs, calculated using EDMS.

Table 8-3 Emissions from Aircraft Operations at Hanscom Field (1,000s of kg/yr)

Year	CO	NO _x	VOC	PM ₁₀ ²	PM _{2.5} ²	CO ₂ ⁴
1995 ³	409.2	14.9	27.9	2.3	2.3	6,728
2000 ³	591.2	25.4	39.4	2.3	2.3	10,108
2005 (EDMS Version 5.1.4.1) ⁴	1,670.0	34.1	112.7	13.5	13.5	19,233
2012	1,123.0	31.9	80.4	9.9	9.9	16,356
2017 ⁸	1,557.0	34.8	51.4	1.9	1.9	17,735
Percent Change: 2005-2012 ⁵	-33%	-7%	-29%	-27%	-27%	-15.0%
Percent Change: 2012-2017 ^{6, 7}	+39%	+9%	-36%	-81%	-81%	+8.4%

Notes:

1. PM₁₀ and PM_{2.5} emissions for some aircraft and CO₂ emissions for all aircraft were calculated separately with a spreadsheet. EDMS does not contain PM emission rates for some aircraft and doesn't include CO₂ emissions for any aircraft.
2. Emissions for 1995 and 2000 were revised from the 2000 *ESPR* using the EDMS Version 4.3.
3. Emissions for 2005 were revised from the 2005 *ESPR* using EDMS Version 5.1.4.1.
4. Percent change is based on 2012 EDMS Version 5.1.4.1.
5. Percent change is based on the difference in results between 2012 when EDMS Version 5.1.4.1 was in use, and 2017 when AEDT Version 2d was used.
6. CO₂ emissions increased due to the ACRP emissions factors, and that methodology differed compared to the 2012 *ESPR* in which the CO₂ emissions came from EDMS, and were not broken down by fuel.
7. The emissions for CO, NP_x and CO₂ show an increase in 2017 from the 2012 *ESPR*. Because there was a decrease in aircraft operations from 2012 to 2017, the change is attributed to the change in model from EDMS to AEDT.

Aircraft engine emission factors (e.g. expressed as the mass of emissions per unit of time, such as grams per second or kilograms per hour) are based on the AEDT default factors for each aircraft and engine type for operating modes (idle, takeoff, climb out, and approach movements). Operating modes are a function of the engine's power setting and resultant fuel flow. AEDT default time-in-mode (TIM) data were also used for each of the phases of the LTO cycle. Aircraft emissions for each of the modes of the LTO were calculated for each type of aircraft by multiplying the number of operations by the emission factor for each operation phase and the TIM. These calculations were performed by AEDT.

As shown in Table 8-3 emissions estimates for VOCs, PM₁₀, and PM_{2.5} decreased between 2012 and 2017, while estimates for CO, NO_x, and CO₂ increased. The decreases in VOCs, PM₁₀, and PM_{2.5} are primarily attributed to a decrease in operations between 2012 and 2017. While a reduction in operations would normally lead to a decrease in all pollutants, the change in model from EDMS to AEDT from 2012 to 2017 resulted in increases in CO, NO_x and CO₂, but are still below the emissions forecast highs of 2005. It should be noted that CO₂ emissions for 2017 are not calculated directly from AEDT and calculated using the ACRP GHG methodology consistent with the GHG inventory as discussed in Section 8.5. The differences between AEDT and EDMS results are primarily due to differences in aircraft operational modes and engine emission factors in each model. The FAA notes that these adjustments are expected; methods used by AEDT are based on the best available science (which evolves and improves over time) and result

in outputs that are more accurate.¹²⁹ More information on the differences between the models is in Appendix E.

The percentage changes in the aircraft emissions between the different years shown in Table 8-3 do not correlate with the percent changes in the number of aircraft operations shown in Figure 8-5 for two reasons. First, the fleet mix of aircraft types is different in each of the six years and, second, the aircraft emissions for 1995, 2000, 2005 and 2012 were developed using various versions of the EDMS model (as the models were updated over time the emissions factors in the models also changed).

To provide some perspective on the relative contribution of Hanscom Field aircraft emissions to regional air quality and to demonstrate that the increases that have occurred are small, Table 8-4 shows the total air emissions for Middlesex County. The emissions data for Middlesex County were obtained from the U.S. EPA National Emission Inventory for the most recent available year, 2014.¹³⁰

Table 8-4 Total Criteria Pollutant Emissions from all Sources in Middlesex County (2014) (1,000s of kg/yr)

Source Type	CO	NO _x	VOC	PM ₁₀	PM _{2.5}	CO ₂ ¹
Point	9,427	6,519	13,456	6,647	1,827	-
Mobile	120,323	15,297	9,755	8,236	3,443	-
Total	129,750	21,816	23,211	14,883	5,277	6,894,604
2017 Hanscom Field aircraft emissions as a % of Middlesex County total emissions²	1.2%	0.16%	0.22%	0.01%	0.04%	0.26%
Notes:						
1. GHG emissions obtained from MassDEP's latest inventory for entire state, completed in 2015 (for 2014 emissions levels), https://www.mass.gov/service-details/ma-ghg-emissions-trends .						
2. The 2017 aircraft emissions totals as a percentage of the total Middlesex County emissions in 2014.						

Changes in emissions estimates over time are dependent on:

- ⇒ The number of operations;
- ⇒ The fleet mix of aircraft types using Hanscom Field; and
- ⇒ The use of various versions of the EDMS model, now replaced by AEDT.

Aircraft emissions rates:

- ⇒ Do not change over time for each individual aircraft and are dependent on two major characteristics unique to aircraft types:
 - 1) The time each aircraft spends in each mode of the LTO cycle at the airport;
 - 2) The passenger-carrying capacity of the aircraft.

¹²⁹ FAA, AEDT Legacy Tools Comparison , June 2016,

¹³⁰ <https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data>

Year 2017 Motor Vehicle Emissions

A mesoscale air quality analysis was conducted for the motor vehicle traffic associated with activities at Hanscom Field. In comparison to a microscale analysis which focuses on smaller areas (e.g. an intersection), a mesoscale analysis calculates emissions over a larger area.¹³¹ Consistent with MassDEP guidance for performing a mesoscale analysis,¹³² total annual emissions of CO, NO_x, PM₁₀, PM_{2.5}, CO₂, and VOC were calculated using the U.S. EPA's Motor Vehicle Emissions Simulator (MOVES).¹³³ The mesoscale air quality study area in this 2017 *ESPR* is the same as the traffic study area analyzed for the 2005 and 2012 *ESPRs*.

The vehicle miles traveled (VMT) for each roadway segment in the study area was calculated by multiplying the length of each segment by that segment's average daily weekday Hanscom Field traffic volume. Average 24-hour traffic volumes were based on peak AM and PM volumes, using the assumption that peak volumes represent 10 percent of the daily traffic. The average weekday daily traffic volumes are typically greater than the average daily volumes for an entire week including weekends. To give a conservative estimate of annual emissions for the study area, the average weekday volumes were multiplied by 365 (days).

Air pollutant emissions for each roadway segment were calculated by multiplying the VMT on each segment by the MOVES2014a predicted pollutant specific emission factor in grams per mile. These calculations were performed in an excel spreadsheet using emission rates predicted by the MOVES2014a model; MassDEP provided inputs used in the MOVES2014a model. The average annual emissions factor for each pollutant took into consideration the time of year of concern for each pollutant (i.e. winter and summer), averaging the two, and utilized an average daily speed range of 25 to 40 mph for each roadway link.

As shown in Table 8-5 emissions from Hanscom Field vehicular traffic for 2017 declined for all pollutants when compared to all prior years shown. The general decline in motor vehicle emissions is primarily attributed to a decrease in traffic generated by Hanscom Field in 2017 compared to 2012 (a decrease of approximately 39 percent, as detailed in Chapter 6 Ground Transportation) as well as upgrades to the vehicle fleet mix through the replacement of older less efficient vehicles and stricter vehicle emissions standards promulgated by the EPA over that time. This decline can also be attributed to the use of the MOVES model, which is more accurate in deriving mobile source emissions factors than its predecessor, MOBILE 6.2.

¹³¹ A mesoscale analysis covers an area larger than the immediate project area, but smaller than an entire regional network. The size of a mesoscale analysis depends on the specific project, but typically includes all roadways affected by the project.

¹³² Massachusetts Department of Environmental Protection, *Guidelines for Performing Mesoscale Analysis of Indirect Sources*, Division of Air Quality Control, May 1991.

¹³³ MOVES replaced the MOBILE6.2 model and is consistent with the FAA *Air Quality Handbook* for estimating mobile source emissions.

Table 8-5 Emissions from Hanscom Field Vehicular Traffic (1,000s of kg/yr)

Year	CO	NO _x	VOC	PM ₁₀	PM _{2.5}	CO ₂
1995	30.0	3.9	2.9	0.6	0.6	-
2000	61.0	6.9	3.0	0.2	0.2	1,496
2005	36.0	4.1	1.6	0.1	0.1	1,312
2012	19.1	2.2	0.9	0.1	<0.1	1,555
2017 ¹	2.9	0.3	0.1	<0.1	<0.1	407
Percent Change: 2005 to 2012	-47%	-46%	-46%	-29%	-40%	+19%
Percent Change: 2012 to 2017	-85%	-86%	-92%	-90%	-83%	-74%

Notes:
1. The 2017 emissions were estimated using the MOVES2014a version with MassDEP inputs, which replaced the MOBILE6.2 model which was used for the 2012 *ESPR*.

Total Year 2017 Emissions

The combined pollutant emissions from both aircraft operations and groundside motor vehicle travel at Hanscom Field are shown in Table 8-6 for each of the six pollutants in 1995, 2000, 2005, 2012, and 2017. The data show that the sum of emissions for aircraft operations and motor vehicle traffic for VOC, PM₁₀, and PM_{2.5} have decreased between 2012 and 2017, while CO, NO_x, and CO₂ increased. The reasons for the changes are included with the results for each component, above. CO₂ for aircraft emissions were estimated based on ACRP guidance using AEDT fuel usage and ACRP emission factors for jet fuel and AVGAS. Tables containing the aircraft data used for the emissions calculations can be found in Appendix E.

Table 8-6 Total Air Emissions at Hanscom Field for Prior and Current Years (1,000s of kg/yr)¹

Year	Source	CO	NO _x	VOC	PM ₁₀	PM _{2.5}	CO ₂ ¹
1995	Aircraft	409.2	14.9	27.9	2.3	2.3	6,728
	Ground Vehicles	30.3	3.9	2.9	0.6	0.6	-
	Total	439.5	18.8	30.8	2.9	2.9	-
2000	Aircraft	591.2	25.4	39.4	2.3	2.3	10,108
	Ground Vehicles	60.8	6.9	3.0	0.2	0.2	1,496
	Total	652.0	32.3	42.4	2.5	2.5	11,604
2005 (EDMS 5.1.4.1) ²	Aircraft	1,670.0	34.1	112.7	13.5	13.5	19,233
	Ground Vehicles	36.1	4.1	1.6	0.1	0.1	1,312
	Total	1,706.1	38.2	114.3	13.6	13.6	20,545
2012 ³	Aircraft	1,123.0	31.9	80.4	9.9	9.9	16,356
	Ground Vehicles	19.1	2.18	0.9	0.1	0.1	1,555
	Total	1,142.1	34.1	81.3	10.0	10.0	17,911
2017 (AEDT)	Aircraft	1,557.0	34.8	51.4	1.9	1.9	17,735
	Ground Vehicles	2.9	0.4	0.1	0.0	0.0	407
	Total	1,559.9	35.2	51.5	1.9	1.9	18,141

Notes:

1. Data to calculate the ground vehicle CO₂ emissions for 1985 and 1995 were not available; therefore, total CO₂ emissions for these years are not available for comparison with later years.
2. The 2005 *ESPR* used EDMS version 4.3 however the emissions were recalculated using EDMS version 5.1.4.1 when it was released for consistency with the 2012 *ESPR*.
3. The 2012 *ESPR* used EDMS 5.1.4.1.
4. Emissions of CO, NO_x, VOC and PM are calculated to the first decimal place.

8.4.2 Analysis of Future Scenarios

As discussed, predictions of future air quality effects from Hanscom Field are based on an emissions analysis of airside operations and groundside motor vehicle traffic for the 2025 and 2035 future planning scenarios. The 2017 *ESPR* planning scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels described in Chapter 3 Airport Activity Levels. The 2025 and 2035 scenarios represent estimates of what could occur (not what will occur) in the future using certain planning assumptions. The future service scenarios are consistent with Massport's 1980 Regulations for Hanscom Field, which prohibit scheduled commercial passenger services with aircraft having more than 60 seats.

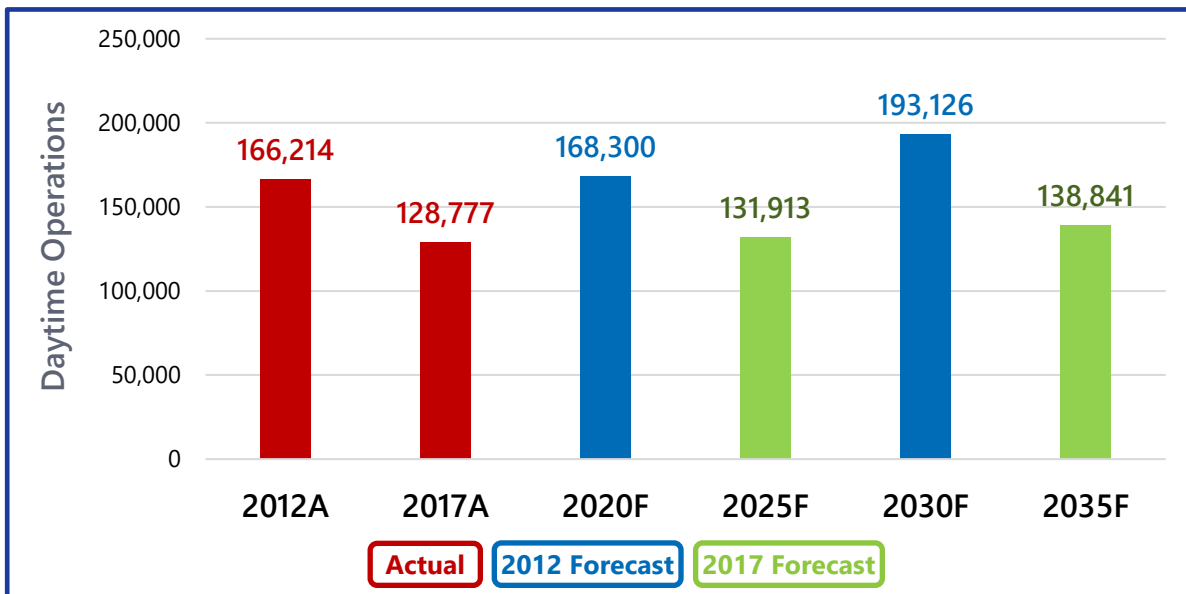
As both future scenarios forecast an increase in aircraft operations over current levels (see Figure 8-6), the airport's current emission levels are expected to rise. However, there are limitations in predicting future emissions beyond 15-20 years from the baseline for aircraft operations using AEDT. The AEDT model is constantly reviewed and updated to include new aircraft, engine types, and the latest emission factors from the International Civil Aviation Organization (ICAO) engine exhaust emission data bank. It does not incorporate expected or potential future technology changes such as the use of alternative fuels, more efficient engines

or future regulatory emissions standards which would decrease emissions. Therefore, the predicted 2025 and 2035 year emission levels represent a conservative estimate of future conditions. Estimated emissions level increases and their associated impacts on air quality under the future scenarios are described below.

Future Aircraft Emissions

The estimation of future aircraft emissions follows the methodology outlined earlier in this chapter. For comparative purposes, Figure 8-6 shows the annual number of operations for 2012 and 2017, as well as the future planning scenarios analyzed in this ESPR in comparison with the 2012 ESPR forecasts. Tables containing the aircraft data used for the emissions calculations can be found in Appendix D.

Figure 8-6 Actual and Forecast Aircraft Operations at Hanscom Field



Source: 2012 ESPR Table 8-9. InterVISTAS, 2018 and Massport EXP NOMS System

Table 8-7 summarizes the expected annual aircraft emissions for the 2025 and 2035 future planning scenarios, and compares these to actual emissions from years 2012 and 2017. In general, aircraft emissions forecasted for each of the future scenarios would be higher than those for the year 2017 based on a predicted growth in operations. The exception is emissions of CO for 2025 and 2035, which show a slight decrease compared to 2017. This is largely attributed to the forecast change in fleet mix in future scenarios, with an increase in jet aircraft operations and a decrease in single engine piston aircraft (which emit higher levels of CO than jet aircraft). The percent decrease in CO for 2025 and 2035 is -5.9 percent and -6.7 percent, respectively.

The largest increases in aircraft emissions are predicted for NO_x, VOC and CO₂, with the smallest increases predicted for PM₁₀ and PM_{2.5}. The increases in these pollutants are expected due to the increase in operations.

The air pollutant emission rates for each aircraft/engine combination are not assumed to change with time in the model, therefore the forecasts are conservative.

Table 8-7 Emissions from Aircraft Operations at Hanscom Field for 2012, 2017 and Forecast Scenarios (1,000s of kg/yr)¹

Year	CO	NO _x	VOC	PM ₁₀	PM _{2.5}	CO ₂
2012 ¹	1,123.0	31.9	80.4	9.9	9.9	16,356
2017 ²	1,557.0	34.8	51.4	1.9	1.9	17,734
2025	1,455.3	42.0	56.1	2.0	2.0	20,553
2035	1,444.6	48.1	61.0	2.1	2.1	23,069

Notes:
 1. EDMS was used to estimate emissions for 2012.
 2. Calculations generated using AEDT version 2d for 2017 and 2025 and 2035 forecasts.

Future Vehicular Emissions

A mesoscale (intermediate range) air quality emissions analysis was conducted for the motor vehicle traffic associated with Hanscom Field. In comparison to a microscale analysis, which focuses on smaller areas (e.g. an intersection), a mesoscale analysis calculates emissions over a larger area. Consistent with MassDEP guidance¹³⁴ for performing a mesoscale analysis, total annual emissions of CO, NO₂, PM₁₀, PM_{2.5}, CO₂ and VOCs were calculated using the EPA's Motor Vehicle Emissions Simulator (MOVES).¹³⁵ The study area and methodology for calculating groundside vehicular emissions is the same as described earlier for 2017. Table 8-8 summarizes the annual emissions from groundside vehicular traffic for the future growth scenarios. Tables showing the data used to calculate the motor vehicle emissions are included in Appendix E. Emissions for 2025 and 2035 are estimated to decrease for all pollutants (except CO₂) when compared to 2017.

The predicted decrease in motor vehicle emissions reflect projected decreases in vehicle emission rates predicted by MOVES 2014a even though additional traffic volumes are predicted in 2025 and 2035. The MOVES model also incorporates assumptions about the changes in average fleet fuel economy over time. Ongoing fleet turnover and the continued implementation of increasingly more stringent emission and fuel quality regulations are expected to reduce pollutants.

¹³⁴ MassDEP, *Guidelines for Performing Mesoscale Analysis of Indirect Sources*. Division of Air Quality Control, May 1991.

¹³⁵ MOVES replaced MOBILE6.2 model and is consistent with the FAA's *Air Quality Handbook* for estimating mobile source emissions.

Table 8-8 Emissions from Hanscom Field Vehicular Traffic for 2012, 2017 and Forecast Scenarios (1,000s of kg/yr)¹

Year	CO	NO _x	VOC	PM ₁₀	PM _{2.5}	CO ₂
2012	19.1	2.2	0.9	0.1	<0.1	1,555
2017	2.9	0.3	0.1	<0.1	<0.1	407
2025	2.8	0.2	<0.1	<0.1	<0.1	457
2035	1.9	0.1	<0.1	<0.1	<0.1	436
Notes:						
1. Emissions levels for CO, NO _x , VOC and PM are calculated to one decimal place.						
Source: HMMH, 2018.						

Hanscom Field generated traffic is only a small percent of the total traffic in the nine square mile traffic study area (i.e., approximately two and half percent of the total traffic in the year 2017).

Total Future Emissions and Air Quality Concentrations

As described earlier in the chapter, Massport used AEDT (the FAA required model) to estimate future scenario emissions from aircraft operations at Hanscom Field, and the EPA MOVES model to estimate motor vehicle emissions in future year scenarios. The results were combined to obtain total emission forecasts for the criteria pollutants, VOCs and CO₂.

The combined emissions from both aircraft operations and motor vehicle traffic at Hanscom Field are shown in Table 8-9 for the six pollutants. This table shows that with the exception of CO, total emissions will increase in the forecast cases as compared to 2017 emissions. Aircraft operations dominate the emission totals, and, as one would expect, the higher emissions for the two future planning years would occur for the 2035 scenario. The predicted increases in pollutant emission and slight decreases in CO in total emissions for 2025 and 2035 are a result of the assumed changes in the fleet mix, the assumed increase in aircraft operations and passengers carried, and the assumed increase in associated motor vehicle traffic.

Table 8-9 Total Air Emissions at Hanscom Field for 2000, 2005, 2012, 2017 and Forecast Scenarios (1,000s of kg/yr)¹

Year	Source	CO	NO _x	VOC	PM ₁₀	PM _{2.5}	CO ₂
2000	Aircraft	591.2	25.4	39.4	2.3	2.3	10,108
	Ground Vehicles	60.8	6.9	3.0	0.2	0.2	1,496
	Total	652.0	32.3	42.4	2.5	2.5	11,603
2005 ²	Aircraft	1,670.0	34.1	112.7	13.5	13.5	19,233
	Ground Vehicles	36.1	4.1	1.6	0.1	0.1	1,312
	Total	1,706.1	38.2	114.3	13.6	13.6	20,545
2012	Aircraft	1,123.0	31.9	80.4	9.9	9.9	16,356
	Ground Vehicles	19.1	2.2	0.9	0.1	0.1	1,555
	Total	1,142.1	34.1	81.3	10.0	10.0	17,911
2017	Aircraft	1,557.0	34.8	51.4	1.9	1.9	17,734
	Ground Vehicles	2.9	0.3	0.1	0.0	0.0	407
	Total	1,559.9	35.1	51.5	1.9	1.9	18,141
2025	Aircraft	1,455.3	42.0	56.1	2.0	2.0	20,553
	Ground Vehicles	2.8	0.2	0.1	0.0	0.0	457
	Total	1,458.1	42.2	56.2	2.0	2.0	21,010
2035	Aircraft	1,444.6	48.1	61.0	2.1	2.1	23,069
	Ground Vehicles	1.9	0.1	0.0	0.0	0.0	436
	Total	1,446.5	48.2	61.0	2.1	2.1	23,505

Notes:

1. Emissions levels for CO, NO_x, VOC and PM are calculated to one decimal place.

2. The emissions levels for 2005 were originally calculated using an earlier version of EDMS, version 4.3 but were subsequently revised using the later model EDMS version 5.1.4.1. The values depicted here are those generated by version 5.1.4.1.

8.4.3 Community Receptor Analysis

An analysis of expected air quality for the 2035 future scenario was prepared for a set of points representing community locations near the airport. Maximum air quality concentrations in the future year scenario 2035 for CO, NO₂, PM₁₀ and PM_{2.5} were estimated at ten receptors surrounding Hanscom Field (the same ones used for the 2012 *ESPR* analysis). Ozone was not modeled as it is not directly emitted (rather it is formed by the emission of precursors including VOCs and NO₂), and SO₂ was not modeled due to the extremely low concentrations in the region.

The first six receptors were located at the closest downwind distance from the center of the airfield to residential or conservation land outside the Massport boundary in the respective towns. Since air pollutant concentrations due to Hanscom Field operations decrease with distance from the airfield, concentrations at any other homes in one of the four adjoining towns will be less than those predicted for receptors one through four.

The maximum concentrations calculated for the ten community locations for the year 2012 presented in the *2012 ESPR* were scaled with the emissions calculated for the *2017 ESPR* to obtain year 2017 results. Scaling is appropriate given that modeling parameters (i.e. source and receptor locations) have not changed from the *2012 ESPR* and only the emission rate for each pollutant is changing.

Maximum air quality concentrations in 2035 for CO, NO₂, PM₁₀, and PM_{2.5} were estimated at the following ten receptors:

- 1) Concord: closest residential area;
- 2) Bedford: closest residential area;
- 3) Lexington: closest residential area;
- 4) Lincoln: closest residential area;
- 5) Minute Man National Historical Park;
- 6) Great Meadows National Wildlife Refuge;
- 7) Concord Center;
- 8) Bedford Center;
- 9) Lexington Center; and
- 10) Lincoln Center.

To derive the scale factors, the total emissions for the scenario with the largest forecasted emissions levels (i.e., the 2035 growth scenario) was divided by the 2012 total emissions presented in the *2012 ESPR*. Then the concentration of each air pollutant for the year 2012 was multiplied by the corresponding scaling factor. After adding in current (2017) background concentrations, the maximum predicted concentration for each air pollutant for the 2035 growth scenario was obtained (see Table 8-10). This scaling methodology is consistent with that used for prior ESPRs.

The concentration levels presented in Table 8-10 are conservative since they are derived from the SCREEN3 dispersion modeling originally presented in the *1995 GEIR* that assumes all airborne emissions up to 3,000

feet are simulated as being released at ground level (see *1995 GEIR*, p. 2-152). Actual air concentrations from Hanscom Field operations will be less than these estimates. Note that the majority of the total predicted concentrations in Table 8-10 come from the conservative background levels assumed in the analysis, not Hanscom Field operations. Thus, actual concentrations for the 2035 planning scenario will be less than those listed, even if activity levels reach those of the future scenarios.

Table 8-10 Modeled Maximum Air Concentrations in 2035 at Ten Community Receptors ($\mu\text{g}/\text{m}^3$)⁴

Source	Receptor	CO 1 Hour ⁴	CO 8 Hour	NO ₂ 1 Hour	NO ₂ Annual	PM ₁₀ 24 Hour	PM ₁₀ Annual	PM _{2.5} 24 Hour	PM _{2.5} Annual
Concentration from Hanscom Operations¹	1	3,588	2,410	69	5	1.5	0.2	1.5	0.2
	2	2,977	2,083	59	4	1.5	0.2	1.5	0.2
	3	1,863	1,304	37	3	0.7	0.1	0.8	0.2
	4	1,804	1,262	34	3	0.7	0.1	0.8	0.2
	5	2,215	1,485	44	4	0.7	0.1	0.8	0.2
	6	1,285	899	25	2	0.4	0.1	0.4	0.1
	7	868	609	17	2	0.4	0.1	0.4	0.1
	8	1,699	1,190	32	3	0.7	0.1	0.8	0.1
	9	855	598	17	2	0.4	0.1	0.4	0.1
	10	876	615	17	2	0.4	0.1	0.4	0.1
Total Concentration Including Background²	1	6,338	3,785	174	52	32	14.2	17	7
	2	5,727	3,458	164	52	32	14.2	17	7
	3	4,613	2,679	142	51	31	14.1	16	7
	4	4,554	2,637	139	51	31	14.1	16	7
	5	4,966	2,860	149	51	31	14.1	16	7
	6	4,035	2,274	130	49	30	14.1	16	7
	7	3,619	1,984	122	49	30	14.1	16	7
	8	4,449	2,565	137	51	31	14.1	16	7
	9	3,605	1,973	122	49	30	14.1	16	7
	10	3,626	1,990	122	49	30	14.1	16	7
Air Quality Standard or Guideline ($\mu\text{g}/\text{m}^3$)		40,000	10,000	188/320 ³	100	150	50	35	12
Notes: 1. Air concentrations are derived from the SCREEN3 dispersion modeling from Hanscom Field operations that assumes all airborne emissions up to 3,000 feet are simulated as being released at ground level. Actual air concentrations will be less than these estimates because emissions above ground level will have a significantly reduced impact on ground-level locations. 2. Background levels measured at various MassDEP monitoring locations, see Table 8-2. 3. For NO ₂ , the 188 $\mu\text{g}/\text{m}^3$ represents the EPA 1-hour NAAQS, while the 320 $\mu\text{g}/\text{m}^3$ represents the MassDEP 1-hour NO ₂ Policy Guideline. 4. Emissions levels above 10 MT/yr are rounded to the nearest whole number.									

Comparison with the standards guidelines shows that the estimated maximum concentrations predicted for 2035 would be in compliance with the NAAQS and the MassDEP 1-hour NO₂ Policy Guideline. Concentration levels for the 2025 future growth scenario would be lower because forecasted activity levels and emissions for 2025 are lower than those forecasted for 2035. Thus, it can be concluded that the air pollutant emissions shown in this 2017 *ESPR* for aircraft and motor vehicles at Hanscom Field for all future planning scenarios would not have an adverse impact on local air quality. Aircraft emissions from Hanscom Field are minimal

compared to air emissions from all sources within Middlesex County and that will remain so in the future operating scenarios.

Residents in Bedford near Runway 29 have expressed concerns about particulate deposition. Visible particles that settle from the air onto surfaces like outdoor lawn furniture or cars originate from many sources. For Bedford, these sources include motor vehicles on Route 128/I-95 and local roads, aircraft, and fuel oil combustion used to heat homes and businesses.

Conservative air concentration estimates of 24-hour PM₁₀ levels at the homes near the end of Runway 29 reveal relatively low levels of particulate matter from aircraft operations equal to only one percent of the NAAQS for the 2035 planning scenario.

8.5 Greenhouse Gas (GHG) Emissions inventory

The *2017 ESPR* Scope Certificate requires the development of the first airport-wide GHG emissions inventory for Hanscom Field, to be used as a baseline to measure and compare future GHG emissions. This aligns with Massport's actions to prepare and update GHG emissions inventories for other facilities, including Logan Airport.

As this is the first GHG Inventory being conducted for Hanscom Field, a few pieces of information are worth noting:

- ⇒ The emission source categories in this *2017 ESPR* are consistent with MEPA's GHG source categories used to analyze the environmental impacts of direct and indirect mobile and stationary source emissions.
- ⇒ This 2017 baseline GHG emissions inventory was prepared following methodological guidance by the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP) and the World Resources Institute's Greenhouse Gas Protocol, consistent with the approach used for Boston Logan's GHG emissions inventories.¹³⁶
- ⇒ The 2017 GHG emissions inventory includes aircraft operations within the ground-based taxi-idle/delay mode and up to the top of the 3,000-foot LTO cycle. For estimating GHGs, the LTO cycle (up to 3,000 feet) uses the default mixing height in AEDT. GHG emissions associated with aircraft ground support equipment (GSE) and aircraft auxiliary power units (APUs), motor vehicles, a variety of stationary sources, and electricity usage were also included.
- ⇒ Although the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) guidelines for the preparation of GHG inventories are designed for specific projects, the GHG inventory prepared for the *2017 ESPR* follows the guidelines as they use widely accepted emission factors that are considered appropriate for airports (including

¹³⁶ Transportation Research Board, Airport Cooperative Research Program, ACRP Report 11, Project 02-06, Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories. http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf.

International Organization for Standardization (ISO) New England electricity-based values). The analysis is also consistent with ACRP guidance.

For consistency with the GHG Emissions Inventories conducted at Boston Logan International Airport since 2008, as well as for comparative purposes, GHG emissions are segregated by ownership and control into categories.¹³⁷ These three categories (listed in Table 8-11) are further characterized by the degree of control that Massport has over the GHG emission sources.

- ⇒ **Category 1: Massport Owned** – These GHG emissions arise from sources that are owned and controlled by the reporting entity (in this case, Massport). Precise definition of Category 1 is sources which are owned by the entity, or sources which are not owned by the entity, but over which the entity can exert control. At Hanscom Field, these sources include Massport-owned and controlled stationary sources (boilers, generators, etc.), Massport fleet vehicles, and purchased electricity. On airport ground transportation and off-airport employee vehicle trips are also included as Category 1 emissions as they are partly controlled by Massport.
- ⇒ **Category 2: Tenant Owned** – This category comprises sources owned and controlled by airport tenants, and include aircraft (on-ground taxi/idle and within the LTO up to 3,000 feet), GSE/APU, electrical consumption, and tenant employee vehicles.
- ⇒ **Category 3: Public/Private Owned** – This category comprises GHG emissions associated with passenger ground access vehicles. These include private automobiles, taxis, limousines, buses, and shuttle vans operating on the off-airport roadway network.

Consistent with ACRP guidelines, the operational boundaries of the GHG emissions are also delineated, reflecting the scope of the emission source according to the GHG Protocol. Table 8-11 lists the scope of each source, which include:

- ⇒ **Scope 1/Direct** – GHG emissions from sources that are owned and controlled by the reporting entity (in this case, Massport) such as stationary sources and airport-owned fleet motor vehicles.
- ⇒ **Scope 2/Indirect** – GHG emissions associated with the generation of electricity consumed on-site, but generated off-site at public utilities.
- ⇒ **Scope 3/Indirect and Optional** – GHG emissions that are associated with the activities of the reporting entity (in this case, Massport), but are associated with sources that are owned and controlled by others. Scope 3 emissions include aircraft-related emissions, emissions from airport tenant's activities, as well as emissions from ground transportation to and from the airport.

¹³⁷ Categorization is based on the methodological precedent set by Greenhouse Gas (GHG) Emissions Inventories over the past decade for Boston Logan International Airport's annual EDR and 5-year ESPR updates.

Table 8-11 Massport Ownership Categorization and Emissions Scope

Massport Emission Ownership Category	Source	GHG Protocol Scope
Category 1 – Massport Owned and/or Controlled	Massport Fleet Vehicle	Scope 1
	On-airport Ground Transportation	Scope 1
	Off-airport Employee Vehicle Trips, including employee commuting	Scope 3
	Ground Service Equipment/Auxiliary Power Units	Scope 1
	Stationary Sources (generators, boilers, etc.)	Scope 1
	Electrical Consumption	Scope 2
Category 2 - Tenant Owned and/or Controlled (includes airlines, government, aircraft operators, fixed-based operators, etc.)	Aircraft (on-ground, within the LTO up to 3,000 feet)	Scope 3
	Auxiliary Power Units/Ground Support Equipment	Scope 3
	Off-airport Employee Vehicle Trips, including employee commuting	Scope 3
	Stationary Sources (including generators, boilers, etc.)	Scope 3
	Electrical Consumption	Scope 2
Category 3 – Public Owned & Controlled	Off-airport Vehicle Trips (Includes private automobiles, taxis, limousines, buses, shuttle vans, etc., operating on the off-airport roadway network)	Scope 3

2017 Greenhouse Gas Emissions Inventory Summary

Table 8-12 displays the summary GHG inventory for Hanscom Field, categorized both by ownership category as well as scope. Emissions for CO₂, CH₄ and NO₂ were calculated and collectively converted to carbon dioxide equivalent, CO_{2e} (a measurement based on the Global Warming Potential of each GHG). The total CO_{2e} for Hanscom Field in 2017 is estimated at 23,892 metric tons (MT). Massport-controlled emissions are around 5 percent of the total.

Table 8-12 2017 Hanscom Field GHG Emissions Inventory Summary (Emissions Expressed in MT/ year)

Massport Ownership Category	Source	Scope	CO ₂ ¹	N ₂ O ¹	CH ₄ ¹	Total CO _{2e} ²
Category 1 – Massport Owned/ Controlled Emissions	GSE/APUs	1	0.90	0.00	0.00	0.91
	Stationary Sources	1	209	0.00	0.00	211
	Off-Airport Roadways ³	3	169	0.01	0.01	170
	Electricity Consumption ^{4, 5}	2	822	0.08	0.01	844
	Total Massport Emissions		1,201	0.09	0.02	1,226
Category 2 – Tenant Owned and/or Controlled	Aircraft ⁶ – Ground Operations	3	8,021	0.24	0.23	8,092
	Aircraft ⁶ – Ground to 3000 ft.	3	9,966	0.24	3.16	10,119
	Stationary Sources ⁷	3	1,177	0.00	0.02	1,183
	GSE/APUs	3	290	0.01	0.02	293
	Off-Airport Roadways ³	3	1,150	0.04	0.06	1,161
	Electricity Consumption ⁴	2	1,342	0.13	0.02	1,379
	Total Tenant Emissions		21,946	0.66	3.51	22,227
Category 3 – Public Owned/ Controlled	Off-Airport Roadways ⁸	3	407	0.12	0.00	439
Total Hanscom Field GHG Emissions			23,554	0.87	3.53	23,892
Massachusetts Statewide Totals (2016)⁹			65,210,677	2,131	71,232	74,165,054
Hanscom Field Emissions as a % of Statewide Totals			0.04%	0.04%	<0.01%	0.03%
Notes:						
1. Fuel emissions were calculated utilizing EPA emission factors https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub .						
2. Total carbon dioxide equivalent, or CO _{2e} , is calculated by applying the Global Warming Potential (GWP) values for each type of GHG in order to convert each to its equivalent mass in CO ₂ . GWP values are from the IPCC's Fifth Report (AR5), 2014.						
3. Employee commuting travel was calculated utilizing 2017 Hanscom Travel Survey.						
4. Electricity was calculated utilizing ISO New England and EPA standards.						
5. Solar PV energy production at Hanscom provides a 20.02 MT reduction in CO _{2e} emissions from what would otherwise be generated by electricity use from the grid.						
6. Aircraft emissions rates were produced by AEDT v2.0d.						
7. For hourly generator use, these are assumed to be diesel generators with <600 hp. The source for CO _{2e} emissions rates is https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf .						
8. MOVES2014a was used to calculate vehicle emissions rates for off-airport roadway traffic associated with Hanscom Field.						
9. Figures obtained from the MassDEP Greenhouse Gas Inventory. https://www.mass.gov/lists/massdep-emissions-inventories#greenhouse-gas-baseline,-inventory-&-projection . MA Statewide totals are calculated based on GWPs in IPCC AR4, where the GWP for N ₂ O is 298 in CO _{2e} , as opposed to the most recent set of GWP values, IPCC AR5, where the GWP for N ₂ O is 265 in CO _{2e} , resulting in a .09% difference. The statewide total for CO _{2e} in MT includes a wider range of GHGs, whereas the scope of this inventory and the character emissions from materials used on site at the airport are primarily limited to CO ₂ , N ₂ O, and CH ₄ .						
10. Emissions levels above 10 MT/yr are rounded to the nearest whole number.						

Figure 8-7 Sources of GHG Emissions According GHG Protocol Scopes

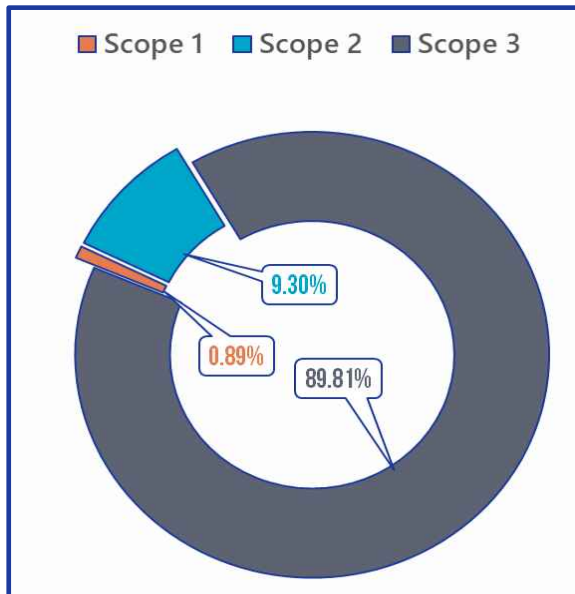
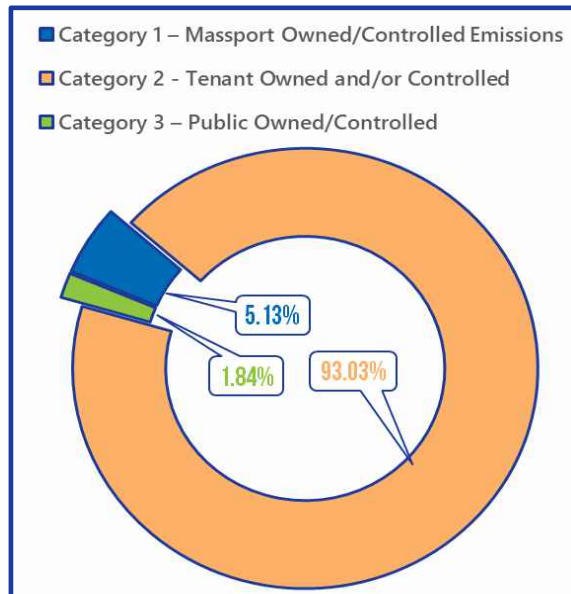


Figure 8-8 Sources of GHG Emissions According to Massport Ownership / Control Category



As Figure 8-7 and Figure 8-8 show, both methods of categorization demonstrate that Massport owned or controlled emissions make up a small percentage of the total GHG emissions for Hanscom Field. Category 1 emissions account for just 5 percent of total emissions, while Scope 1 emissions account for less than 1 percent of emissions. The major difference between the two categorizations is that “Category 1 – Massport Owned/Controlled Emissions” includes emissions from electricity usage, which is considered Scope 2 under the GHG Protocol.

When segregated by the GHG Protocol scopes, as displayed in Figure 8-7, Scope 3 GHG emissions include aircraft operations up to 3,000 feet, APUs/GSEs, tenant roadway use, tenant stationary sources (including emergency generators and boilers), and public roadway use. These Scope 3 sources represent the largest source of GHG emissions at Hanscom Field, at nearly 90 percent. Scope 2 GHG emissions from electrical consumption on site are the second largest source at 9 percent. Finally, Scope 1 GHG emissions, including Massport-owned and controlled emissions from vehicles and stationary sources (like generators and boilers) represent less than 1 percent of total emissions.

Analysis of Future Greenhouse Gas Emissions

Based on results from the aircraft operational analysis in AEDT v2.0d as well as the mesoscale traffic analysis conducted in MOVES2014a, future GHG emissions scenarios for 2025 and 2035 were forecasted. As stated in this document, these projections represent conservative estimates due to a variety of reasons including model limitations, unknown future regulatory requirements, technological advancements, and potential use of alternative fuels.

Figure 8-9 displays the GHG emissions in metric tons of CO₂e¹³⁸ from public owned/controlled vehicular traffic according to the mesoscale analysis conducted for this 2017 *ESPR*, as documented in Section 8.4 [this number is larger than the CO₂ emissions from vehicular traffic reported earlier in the chapter because it incorporates methane (CH₄), and nitrous oxides (N₂O) as modeled in MOVES].

As the figure shows, there is an expected increase in GHG emissions from vehicular traffic in 2025, and a return to 2017 levels by 2035. Although the forecasted VMT in 2025 and 2035 are higher than 2017 (see Appendix E, Table E-1, Table E-2 and Table E-3), the CO₂ emissions rate per mile is forecasted to drop in future years by MOVES2014a (as future vehicle fleets are assumed to be more fuel efficient). The 2017 average CO₂ grams/mile in the mesoscale analysis is 354, while the values for 2025 and 2035 are 271 grams/mile and 213 grams/mile, respectively (see Tables E-1, E-2 and E-3).

Figure 8-10 displays a steady increase in GHG emissions from aircraft operations in the forecast scenarios, which aligns with the increase in number of operations predicted in Chapter 3. GHG emissions levels for the 2025 and 2035 are forecasted to increase by 16 and 30 percent over 2017 levels, respectively. As this is the baseline GHG inventory, historical data is unavailable, preventing a comparison of 2017 to prior years, and limiting future forecasting. Future inventories will allow for better predictions as well as better contextualization of inventory results.

Figure 8-9 Forecast GHG Emissions from Vehicular Traffic

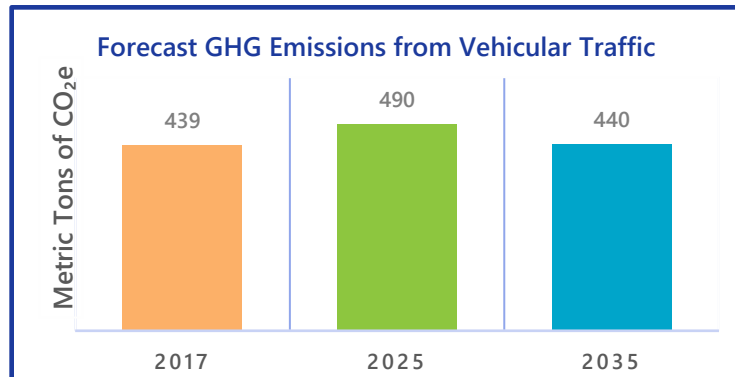
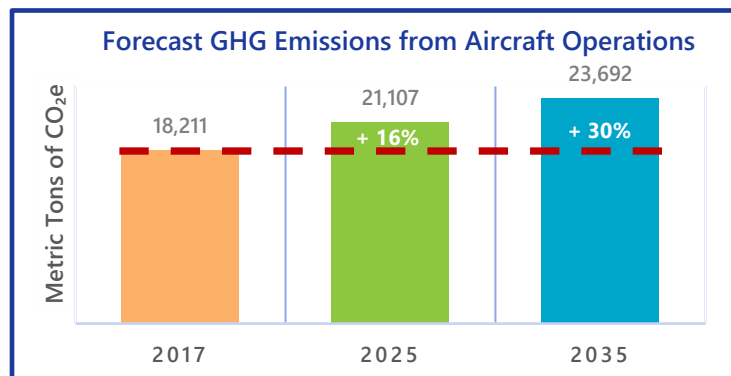


Figure 8-10 Forecast GHG Emissions from Aircraft Operations



¹³⁸ Emissions of various GHGs can be converted to an equivalent amount of CO₂ based on global warming potential values. This measure is referred to as carbon dioxide equivalent (CO₂e).

8.6 Potential Environmentally Beneficial Measures

As described in this chapter, the maximum air quality concentrations for all future planning scenarios will comply with the NAAQS. In addition, Massport continues to implement beneficial measures to reduce on-site emissions where practicable. These measures are discussed below for fuel handling, ground service equipment, building heating/cooling, aviation support, airside operations, and the clean fuel vehicle program.

8.6.1 Fuel Conversion of Ground Service Equipment and Massport Groundside Vehicles

An inventory of current GSE and Massport groundside fleet vehicles at Hanscom Field is provided in Table 8-13. At present, approximately ten percent of the GSE and fleet vehicles at Hanscom Field are alternatively fueled, either by electricity or by propane (compared to eight percent in 2012).

Table 8-13 Ground Service Equipment and Vehicles by Fuel Type at Hanscom Field

Type of Vehicle or Equipment	Gasoline	Diesel ¹	Propane	Electric
Massport Fleet				
Cars/Vans/SUVs/Pick-up Trucks	10	3		
ARFF Truck		1		
Golf Carts				2
Snowplow Trucks/Snowblowers/Sweepers	1	18		
Large Field Tractors		2		
Front-end Loaders		2		
Forklifts			1	
Small Tractors/Mowers/Bobcat	1	7		
FBO: Signature				
Cars/Vans/Pickup Trucks	14			
Snowplows/Deicing Trucks		2		
Fuel Tanker Trucks		8		
Belt Loader/Tugs/Air Stairs	6	4		3
Golf Carts				2
Forklifts			1	
Ground Power Units		3		
FBO: Jet Aviation				
Cars/Vans/Pickup Trucks	8			
Tugs/Belt Loaders/Air Stairs	10	2		6
Deicing Trucks	2	1		
Fuel Tanker Trucks		8		
Golf Carts				1
Ground Power Units	2	6		
Forklifts			1	
FBO: Rectrix				
Cars/Vans/Pickup Trucks	2			
Tugs/Belt Loaders/Air Stairs	2			2
Deicing Trucks				
Fuel Tanker Trucks		2		2
Golf Carts				1
Ground Power Units		2		
Small Tenants²				
Cars/Vans/SUVs	44	4		
Tugs	1	2		2
Heavy Equipment-		8		
Snow Removal Contractors (seasonal)				
Heavy Equipment – Trucks, Loaders	1	25		
Total³	104	110	3	21
Notes:				
¹ As part of EPA regulations, ultra-low sulfur diesel fuel for on-road diesel vehicles was phased-in starting in 2006.				
² Tenant vehicles not specifically addressed as part of the Jet Aviation or Signature Flight support fleet.				
³ Electric and propane represent 10.1% of total GSE and fleet vehicles (24 of 238).				

Ground service and landside conversions to alternative fuels were considered and discussed in the 2012 *ESPR*. GSE operations are not a significant source of emissions at Hanscom Field in comparison to aircraft emissions. The majority of GSE operations with Massport-owned equipment involve airport maintenance (e.g. snow plowing, snow blowing and runway sweeping) with large vehicles that, given their power needs, are not presently candidates for conversion to alternate fuels. Fleet vehicles are more likely candidates for the use of alternative fuels along with electric GSE and gate electrification. Alternative fuels include electric, hybrid, biodiesel, propane, and natural gas.

As cited above, Massport has made progress in this area and owns two electric vehicles at Hanscom Field. Massport will consider additional Alternative Fueled Vehicles (AFVs) for new vehicle purchases in the future. Some tenants also have electric-only vehicles in their fleet that require 110/220v wall plug connections. Chapter 11 provides additional information on electric vehicles. As part of their electric vehicle and ground service equipment charging initiative, Massport has recently investigated the installation of electric charging stations at Hanscom Field to support the use of electric vehicles to help reduce GHG emissions. GSE operations by the tenants involve a mix of large and small equipment, some of which are electric-powered. While power needs for some of this equipment (e.g. the snowplows, tanker fuel trucks) preclude their use of alternative fuels, Massport will encourage tenants to consider alternatively fueled GSE, where appropriate, when making purchases of new equipment.

Building Heating and Cooling

In October of 2011, Hanscom installed 222 PV solar panels, mounted on the roof and side of the Civil Air Terminal building. Panels are located on the south-facing side of the building roof and a series of wall-mounted panels are on the façade of the building. The system has a nameplate capacity¹³⁹ of 51 kilowatts, and produced over 79,000 kWh of electricity in 2016, equivalent to approximately 4 percent of Massport's total electricity consumption at Hanscom Field.¹⁴⁰ As described in Chapter 11, Hanscom Field tenant Boston MedFlight also added solar panels.

Massport and Hanscom Field tenants have undertaken other measures to improve energy efficiency and reduce emissions from their facilities, using green design and construction standards, such as the U.S Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system. For example:

- ⇒ Massport's permanent Airport Rescue & Firefighting (ARFF) and United States Customs and Border Protection (USCBP) Building facility at Hanscom Field (which began construction in 2018) is designed to LEED Gold standards. Sustainability considerations were incorporated throughout the buildings' planning, design, and construction phases. Innovative whole-building energy simulation modeling was utilized by

¹³⁹ Nameplate capacity is the intended, full load sustained output of a power plant or renewable energy system.

¹⁴⁰ Figure obtained from Massport annual utility data renewable energy generation statistics

architects during the design process to optimize energy performance, projected to achieve 30 percent energy savings.

- ⇒ The Rectrix FBO facility is designed to LEED Silver standards and is awaiting certification (by the U.S. Green Building Council). The facility uses energy efficient LED lighting and natural gas for heating.
- ⇒ Jet Aviation's new hangar and FBO facility are designed to LEED Silver standards (and are awaiting completion of the certification as of May 2019). Jet Aviation uses LED lighting and high efficiency condensing boilers for heating, and their vehicle maintenance shop uses a recycled oil-fired burner for heating.
- ⇒ Boston MedFlight's new facility is designed to LEED Silver standards (and is awaiting completion of the certification as of May 2019).

Clean Fuel Vehicle Program

Massport has made progress in bringing alternative fueled vehicles (AFVs) into its fleet at Hanscom Field. At present, two of Massport-owned fleet vehicles are electric. Massport will continue to consider AFVs for any new vehicle purchase in the future. Also, as Massachusetts has adopted the California Low Emission Vehicle program, any new conventional-fueled vehicle added to the Hanscom fleet in the future will have very low emissions, and will automatically comply with the low emission goals of the federal Clean Fuel Fleet Program (40 CFR Part 88).¹⁴¹

Status of Lead Free Avgas in the United States

The FAA is currently working through a collaborative industry-government program, known as the Piston Aviation Fuels Initiative (PAFI), to facilitate and evaluate development of an alternate fuel for leaded aviation gasoline.¹⁴² As of May 2019, development of PAFI fuels is ongoing; research and testing of alternatives continue at the FAA's William J. Hughes Technical Center in Atlantic City, NJ. PAFI plans to facilitate deployment of the alternative when a suitable alternative is identified. See Appendix E for additional information on the current status of lead free Avgas research.

¹⁴¹ Published March 1, 1993, amended May 4, 1999. Title 40 CFR Part 88, Subpart C. Clean Fuel Fleet Program. <https://ecfr.io/Title-40/pt40.20.88> and see also EPA, August 1998, Clean Fuel Fleet Program Implementation. <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1009ZL8.txt>

¹⁴² FAA Unleaded AVGAS Transition Aviation Rulemaking Committee (UAT ARC). February 2012. *Final Report, Part I: Body Unleaded AVGAS Findings & Recommendations*. Available at: http://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Avgas.ARC.RR.2.17.12.pdf

9

Wetlands, Wildlife & Water Resources



This chapter presents an overview of the natural environment at Hanscom Field as well as a summary of Massport's current efforts to minimize impacts to the natural environment from airport activities. The potential impacts to the natural environment and water quality are presented for the 2025 and 2035 scenarios.

This chapter provides information about wetlands, wildlife and water resources. The information establishes year 2017 conditions by reporting data from various sources that include the 2012 Environmental Status & Planning Report (ESPR), 1998 Hanscom Field Wetlands Delineation Location Map and updates, the 2004-2008 and 2009-2013 Hanscom Field

Vegetation Management Plan (VMP), the Massachusetts Natural Heritage and Endangered Species Program's (NHESP) current inventory of rare species, Geographic Information System (GIS) data provided by MassGIS, and reports to the National Wildlife Strikes Database. This chapter also reports on the status of the VMP, the Stormwater Pollution Prevention Plan (SWPPP), the Shawsheen River water quality monitoring program, and the 2009 National Pollutant Discharge Elimination System (NPDES) permit that includes nine Hanscom Field tenants.

9.1 Key Findings

Wetlands, wildlife, and water resource areas at Hanscom Field are fundamentally unchanged from the 2012 *ESPR*. With only minor exceptions, the surrounding habitat areas are well established with little variation from year-to-year. Based on the relatively static nature of field conditions and the large extent of the airfield, updates to wetland mapping tend to occur on a project-by-project basis. There have only been a few project-specific new wetland delineations of existing wetlands at Hanscom Field since 2012. As stated in Chapter 2, there have been a series of airport facility and infrastructure improvements, initiatives, and/or studies undertaken at Hanscom Field since the 2012 *ESPR*. During the planning process for each of these improvements, project-specific wetland delineations, if needed, were undertaken.

Since the 2012 *ESPR*, Massport prepared a 2014-2018 VMP update and continued to mitigate runway safety obstructions using the recommendations during that time period. The next VMP update will address the management interval period of 2019-2023 and will be completed later in 2019.

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) revised the statewide inventory mapping in 2016. As a result, some areas in the North Airfield area that were formerly designated as critical rare species habitat were no longer designated as such, since those areas did not contain the requisite special habitat requirements of the rare bird species (Grasshopper Sparrow and Upland Sandpiper) known to inhabit other areas of the airfield.

Consultation with the Massachusetts Division of Fisheries & Wildlife (MADFW) (August 2018) revealed that Hanscom Field, *"or a portion thereof, is located within Priority Habitat 1128 and 1555 (PH 1128, PH 1555) and estimated Habitat 1623 and 1096 (EH 1623 and EH 1096) as indicated in the Massachusetts Natural Heritage Atlas (14th Edition)"* for two turtle and two bird species. The priority and estimated habitat designations for the two turtle species – the State Threatened Blanding's Turtle and the State Special Concern Wood Turtle – were recent additions to the MADFW consultation response since the 2012 *ESPR*. Habitat for the Blanding's Turtle lies adjacent to but outside of the Hanscom Field property, while the mapped habitat for the Wood Turtle lies on Hanscom Field property. Also, since the last *ESPR* document was published, the Northern Long-eared Bat (*Myotis septentrionalis*) was listed as threatened under the federal Endangered Species Act on April 2, 2015.

Because Massport's long-standing strategy is to maximize reuse of pre-developed areas of the airport, the 2025 and 2035 scenarios are designed to avoid impacts on vernal pools, wetlands, rare or endangered species habitat, and water quality. Wherever practicable, Massport also looks for opportunities to enhance existing environmental conditions.

All of the future planning concepts that could occur over these time periods are focused on areas more than one-half mile from any of the certified vernal pools in the western portion of the airport. As has been Massport's policy, planning for any facilities would seek to avoid or

minimize both direct and indirect adverse impacts to resource areas through the design process. In the event there are unavoidable impacts, mitigation would be proposed.

When considering potential habitat impacts, indirect impacts are not expected to disrupt these populations since these species currently occupy an active airport environment with a managed (regularly mowed) airfield (see Figure 9-2). Potential water quality impacts would be avoided through the continued implementation of construction-phase stormwater pollution prevention plans (SWPPPs) under the EPA's Construction General Permit (CGP), the update of the airport operations SWPPP required by the Multi-Sector General Permit (MSGP), and conformance with applicable standards for stormwater management required for site development or redevelopment by the Massachusetts Department of Environmental Protection (MassDEP). Where practicable, Massport also looks for opportunities to enhance groundwater infiltration.

Some of the planning areas in the 2025 and 2035 scenarios contain wetland resources or are located near wetlands. Massport will make every effort to avoid, minimize, and mitigate potential wetland impacts for future Massport or tenant projects. Projects involving work within wetland resource areas or their buffer zones require applications to the appropriate conservation commissions for permitting under jurisdiction of the Massachusetts Wetland Protection Act (WPA).

During 2003 and 2004, Massport conducted a deicing study (Hanscom Field Deicing Study, 2003) and monitoring effort at Hanscom Field. That study concluded that neither current nor future scenario deicing activities at Hanscom Field would adversely affect the water supply for Bedford or Burlington, nor would they adversely affect the ecosystem of the Shawsheen River or Elm Brook. Hanscom uses less than 100,000 gallons of deicing fluid on an average annual basis (<30,000 gallons of aircraft deicing fluid was used during the 2017-2018 deicing season [November 1 – April 15]), and is therefore not subject to benchmark monitoring that is typically required as part of the National Pollutant Discharge Elimination System (NPDES) MSGP (see Runway Deicing section for more details). Since future scenario deicing efforts are not expected to change, the conclusion of no adverse outcomes remains.

9.2 Year 2017 Conditions

The following section describes the existing Hanscom Field environment in terms of geographic and geologic characteristics, wetlands and surface water features, wildlife habitat, rare and endangered species, and groundwater. It also describes Massport's efforts to maintain and improve the quality of stormwater runoff from the site. In addition, an update on the environmental auditing programs, MassDEP-listed sites, and the Hanscom Air Force Base (AFB) environmental restoration program is provided.

9.2.1 Geographic and Geologic Conditions

A general discussion of the geographic and geologic characteristics is provided below.

Geography and Topography

Hanscom Field is situated in the Eastern Plateau Physiographic Region, a low-lying and well-dissected¹⁴³ region of eastern Massachusetts. Primary drainage for this region is provided by the Merrimack, Parker, Rowley, Ipswich, Concord, Sudbury, Assabet, Charles and Neponset Rivers. The United States Geological Survey (USGS) maps the elevation of Hanscom Field ranging from a high of about 250 feet above mean sea level (AMSL) just west of the airfield to a low of approximately 118 feet AMSL east of the runways, with the majority of the study area below 150 feet AMSL.

Geology and Soils

Hanscom Field is underlain by a complex assortment of Pleistocene Epoch glacial and recent deposits that overlay Silurian and Ordovician Period igneous and metamorphic bedrock. Repeated advances and retreats of continental glaciers removed the pre-glacial deposits, shaped the bedrock, and deposited unconsolidated material in the form of glacial till and outwash deposits. Following retreat of the last glacier approximately 13,000 years ago, peat developed in wetland areas, and fill material was added during the development of the airfield in the last century.

Native soils within the perimeters of Hanscom Field have been disrupted by construction and associated earth-moving activities. The Natural Resource Conservation Service (NRCS) has classified most of the soils on the airfield as udorthents. Udorthents are defined by the United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS), as a map unit consisting of well-drained to excessively well-drained soil composed of cut areas, filled areas, or both. They are often in association with urban areas. In areas that were cut, the surface layer has been removed and in fill areas, typically more than 20 inches of soil material has been placed on the surface. Often both cut and fill areas occur in close proximity, as areas were often graded and smoothed forming a complex pattern of cuts and fills. Middlesex County-wide soils data was obtained from the Soil Survey Geographic Database (SSURGO), which includes updates to soil boundaries and their respective acreages. Based on these updates, no changes to the mapped soils have been identified since 2012.

9.2.2 Wetlands

The following section describes the current status of the state and federally-protected wetland resource areas at Hanscom Field in the towns of Bedford, Concord, Lexington, and Lincoln. Descriptions of wetland resource types and the criteria for their identification follow.

¹⁴³ Refers to the dissection of the land by many streams and rivers.

Descriptions of the individual Hanscom Field wetland areas' vegetation, soils, and hydrology are presented in Table 9-1. Wetland areas are depicted in Figure 9-1. This information was derived from a review of existing documents, including the *2012 ESPR*; wetland delineations performed for the 2004-2008 Hanscom Field Vegetation Management Plan; wetland delineations performed in 2010 and 2012 in association with onsite activities, information collected for a variety of environmental studies associated with airport facility and infrastructure improvement projects; and a review of all available GIS data from multiple sources including MassGIS. No on-site field investigations or delineations were conducted as part of this wetland update.

The *2012 ESPR* evaluation of Hanscom Field divided the airfield into three distinct zones: Zone 1 occupies most of the airfield, including all runways and taxiways as well as the ends of Runways 5 and 11; Zone 2 refers to the areas west of Runway 29; and Zone 3 is located southwest of Runway 23. The *2017 ESPR* update utilizes these same boundaries for consistency.

The wetland resource areas at Hanscom Field include wetlands subject to regulation by both the Commonwealth of Massachusetts and U.S. Army Corps of Engineers (USACE). The regulations of the Massachusetts WPA (310 Commonwealth of Massachusetts Regulations [CMR] 10.00 et seq.) define five freshwater wetland resource areas subject to protection: Banks; Bordering Vegetated Wetlands; Land Under Waterbodies/Waterways; Bordering/Isolated Land Subject to Flooding; and Riverfront Area. Each of these resource area types is defined as follows:

- ⇒ **Banks** are land areas that normally abut and confine a water body. Banks occur between a waterbody and a vegetated wetland or adjacent floodplain, or between a waterbody and an upland.
- ⇒ **Bordering Vegetated Wetlands** (BVW) include those vegetated freshwater wetlands that border on water bodies and waterways. The technical criteria and methodology utilized to identify and delineate BVW is set forth in Delineating Bordering Vegetated Wetlands under the Massachusetts WPA (DEP, 1995). Criteria for identifying and delineating this resource area include the presence of a plant community dominated by wetland indicator species, and signs of hydrology. The presence of hydric soils within the wetland is considered an indicator of hydrology.
- ⇒ **Land Under Water Bodies/Waterways** (LUWB) is the land area under any creek, river, stream, pond, or lake and is a resource area subject to protection under the Massachusetts WPA.
- ⇒ **Bordering Land Subject to Flooding** (BLSF) is an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. BLSF extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland. BLSF boundaries are the maximum lateral extent of floodwater, which will theoretically result from the statistical 100-year storm. The extent of Bordering Land Subject to Flooding is typically derived from examining FEMA Flood Insurance Rate Maps.

- ⇒ **Isolated Land Subject to Flooding** (ILSF) are isolated depressions or closed basins without an inlet or outlet. It is an area which, at least once per year, confines standing water to a volume of at least one-quarter acre-feet and an average depth of at least six inches.
- ⇒ **Riverfront Area** is land between a perennial river's mean annual high-water line and a parallel line located 200 feet away, measured horizontally outward from the river's mean annual high-water line. The perennial status of a waterway is generally determined by examination of the USGS topographic map.

A 100-foot buffer zone is associated with state-regulated Bank and Bordering Vegetated Wetland.

The USACE regulations that accompany the Federal Clean Water Act [33 CFR Parts 321-330 (November 12, 1986)] define waters of the United States as aquatic habitats that include open water areas and wetlands. Wetlands are further defined as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. The USACE requires the acquisition of permit approvals for impacting federal-jurisdictional wetland resources. The USACE has approved 23 General Permits for the Commonwealth of Massachusetts under which projects with minor impacts to federal wetlands may receive USACE approval. For projects with very minor impacts to federal wetlands, the USACE allows approval under the "Self-Verification" process, which does not require submittal of a permit application. In this case, Massport would still need to obtain approvals from local commissions, per the Massachusetts Wetland Protection Act (WPA). No separate USACE filings have been made at Hanscom Field.

Wetlands generally include swamps, marshes, bogs, and similar areas [33 CFR 328.3(b)]. This definition emphasizes a wetland's attributes of hydrophytic vegetation, hydric soils, and hydrology. Pursuant to the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) (the Manual), the mandatory technical criteria that characterize these parameters are outlined as follows:

- ⇒ **Hydrophytic Vegetation:** The predominant vegetation consists of macrophytes, which typically grow in soils that are periodically deficient in oxygen as a result of excessive water content. The U.S. Fish and Wildlife Service (USFWS) publication, "National List of Plant Species that Occur in Wetlands: Northeast (Region 1)" (Reed, 1988) and its 1995 supplement, were used to classify plant species according to their frequency of occurrence in wetlands.
- ⇒ **Hydric Soils:** These are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions (typified by thick organic surface layers, gleying, or mottles) within a depth of 18 inches.
- ⇒ **Hydrology:** Addresses areas that are saturated to the surface or inundated at some time during the growing season of the prevalent vegetation. Typical indicators include surface-scoured areas and water-stained leaves.

Based on a review of the existing site and relevant information, the current status of the wetland resource areas at Hanscom Field is relatively unchanged from those identified in the 2012 *ESPR*. A description of the vegetation, soils, hydrology, and presumed values of these areas is provided in Table 9-1 (Large wetland complexes are described as single wetlands on the figure and in the table).

Table 9-1 Description of Wetland Resources

Wetland I.D.	Resource Areas ¹	Wetland Type ²	Soil Type ³	Notes	2017 Update
1-1 2010	BVW, Bank, LUWB, Riverfront	PFO1, PSS, R3	Saco	This wetland complex is comprised of forested and scrub/shrub wetland types with several channelized drainage swales which flows into the Shawsheen River. Dominant species include Red Maple, Trembling Aspen, Glossy Buckthorn, Highbush Blueberry, Silky Dogwood, Speckled Alder, and Cinnamon Fern. This wetland boundary was left open at the property limit.	No change since 2012.
1-2 2010, 1998	BVW, Bank, LUWB	PFO1, PSS1, R4, PEM	Scarboro, Freetown	This wetland complex is primarily a red maple swamp with scrub/shrub and emergent portions. Dominant vegetation includes Red Maple, Highbush Blueberry, Glossy Buckthorn, Tussock Sedge, Soft Rush, and Sphagnum. Beaver activity has flooded a portion of this wetland between 2012 and 2017, but recent 2018 aeriels reveal the flooded areas have been drained.	No change since 2012.
1-3 GZA -K 2010 2016	BVW	PSS6	Udorthents - Sandy	This scrub/shrub wetland wraps around the end of Runway 23.	Based on GZA wetland delineation report 2016.
1-4 1998 2016	BVW, Bank	PSS1, PEM1	Scarboro, Udorthents -Sandy	Wetland 1-4 is a detention basin that borders on a larger red maple swamp.	No change since 2012.

Wetland I.D.	Resource Areas ¹	Wetland Type ²	Soil Type ³	Notes	2017 Update
1-5 1998	Non-Jurisdictional	PSS1	Udorthents -Sandy	This wetland is a relatively small isolated depression within a mowed area. It is not a state jurisdictional area.	No change since 2012.
2-1 1998, 2010 2016	BVW, Bank, LUWB, Riverfront	PFO1, PSS1, PEM1, R3, R4	Freetown, Wareham, Scarboro, Swansea	This wetland complex is associated with Elm Brook and contains a 200-ft riverfront area. It contains forested, scrub/shrub and emergent wetland types. Dominant species include Red Maple, Highbush Blueberry, Glossy Buckthorn, Northern Arrowwood, Woolgrass, Tussock Sedge, Soft Rush, and Sphagnum Moss.	No change since 2012.
2-2 2010	Non-Jurisdictional	PSS1, PEM1	Udorthents -Sandy	Not a state-jurisdictional wetland area	No change since 2012.
2-3 2010	Non-Jurisdictional	PUB3	Deerfield	This is an isolated non-jurisdictional wetland area with limited vegetation. This area was previously identified in the 1995 GEIR and 2000 <i>ESPR</i> as a possible vernal pool.	No change since 2012.
2-4 2010	Certified Vernal Pools	PSS1, PUB, PEM1	Windsor, Deerfield	This wetland area is composed of several isolated wetlands apparently formed within depressions created by past earth moving activities. They are scrub/shrub and emergent wetlands dominated by willow, Silky Dogwood, Purple Loosestrife, and Sensitive Fern. According to the Massachusetts Natural Heritage Atlas 13th edition, this area contains two certified vernal pools.	No change since 2012.
2-5 2010	Certified Vernal Pools	PSS1	Deerfield	This isolated area is also apparently formed in a man-made depression and contains Purple Loosestrife and Sphagnum Moss. According to the Massachusetts Natural Heritage Atlas, this area has been certified as a vernal pool.	No change since 2012.

Wetland I.D.	Resource Areas ¹	Wetland Type ²	Soil Type ³	Notes	2017 Update
2-6 1998, 2010	Non-Jurisdictional	PSS1 PFO1	Deerfield	This isolated wetland has possibly formed in a man-made depression in a disturbed area. It is a forested and scrub/shrub wetland type dominated by Red Maple, American Elm, Glossy Buckthorn, Silky Dogwood, Northern Arrowwood, and Multiflora Rose.	No change since 2012.
2-7 2010	Non-Jurisdictional	PFO1 PSS1	Scarboro	This isolated wetland has possibly formed in a man-made depression in a disturbed area. It is a forested and scrub/shrub wetland type dominated by Red Maple, American Elm, Glossy Buckthorn, Silky Dogwood, Northern Arrowwood, and Multiflora Rose.	No change since 2012.
2-8 1998, 2010	BVW	PFO1, PSS1, PEM1	Scarboro	This wetland is a red maple swamp that also contains portions of scrub/shrub wetland and emergent wetland. It receives road drainage from Old Bedford Road.	No change since 2012.
2-9 1998 2016	Bank, LUWB	R4	Udorthents - Loamy	This area is an open drainage ditch that outlets to Elm Brook.	No change since 2012.
3-1 1998	ILSF Possible	PFO1	Canton	Wetland 3-1 appears to be man-made, either inadvertently or for stormwater management purposes. Wetlands 3-1 is forested and scrub/shrub wetlands with small emergent areas. Dominant species in the forested and scrub/shrub areas include Red Maple, Glossy Buckthorn, Gray Birch, Trembling Aspen, Speckled Alder, and Cinnamon Fern.	Mapping shows a hydrology connection adjacent to this wetland.

Wetland I.D.	Resource Areas ¹	Wetland Type ²	Soil Type ³	Notes	2017 Update
3-2 1998	Potential BLSF or BVW	PFO1	Canton	Wetland 3-2 appears to be man-made, either inadvertently or for stormwater management purposes. Wetland 3-2 Wetlands 3-1 is forested and scrub/shrub wetlands with small emergent areas. Dominant species in the forested and scrub/shrub areas include Red Maple, Glossy Buckthorn, Gray Birch, Trembling Aspen, Speckled Alder, and Cinnamon Fern.	Mapping shows a hydrology connection adjacent to this wetland.
3-3 1998 2016	BLSF	PEM1	Canton	Wetlands 3-3 is a vegetated swale dominated by emergent species such as Cattail and Purple Loosestrife.	Was Delineated in 2016 as wetland flag line D 30-36.
3-5 1998	Non-Jurisdictional	PFO1	Canton	Wetland 3-5 appears to be relatively undisturbed forested wetland dominated by Red Maple, Trembling Aspen, and Winterberry.	Connected to No.3 Delineated 2012.
3-8 1998, 2010	BVW, Bank, BLSF, Riverfront	PFO1, PSS1, PEM1, R4	Freetown, Wareham, Deerfield, Birdsall	This relatively large and undisturbed wetland complex consists of forested, scrub/shrub, and emergent communities. It is also within the Elm Brook floodplain which generates a 200-ft riverfront area. Recent aeriels show an area of PUB (shallow Marsh or Fen) within the system. Forested red maple swamp with a Glossy Buckthorn understory is the dominant type of wetland in this complex. Portions of the complex also include Purple Loosestrife dominated marsh and farmed areas.	No change since 2012.
Wetland No. 1 (3-9) 2012 2016	BVW	PEM1	Canton	This wetland consists of an emergent plant community, with a large number of soft rush present. Hydric soils are present with abundantly mottled and saturated at the surface, with some standing water.	Was Delineated in 2016 as wetland flag line D 1-20.

Wetland I.D.	Resource Areas ¹	Wetland Type ²	Soil Type ³	Notes	2017 Update
Wetland No. 2 2012	BVW	PSS1, PEM1, PFO1	Canton	This wetland contains forested scrub/shrub and emergent wetlands. It is located south of Wetland No. 1, (wetland 3-9) but is not connected to it. The most abundant canopy species includes Red Maple and Eastern Cottonwood. The most common understory species includes Speckled Alder, Pussy Willow, Oriental Bittersweet, Jewelweed, and Cattail. Within a portion of this wetland, the characteristics of a certified vernal pool have been observed. To date the pool has not been certified by the Massachusetts Natural Heritage and Endangered Species Program.	No change since 2012.
Wetland No. 3 2012	BVW	PFO1	Canton	This wetland is primarily forested and drains in a westerly direction to the drainage channel adjacent to the existing T hangars. Dominant canopy species include Red Maple and Yellow Birch, while understory species consist of Northern Arrowwood, Northern Spicebush, Skunk Cabbage, and Sensitive Fern. Within a portion of this wetland, the characteristics of a certified vernal pool have been observed. To date the pool has not been certified by the Massachusetts Natural Heritage and Endangered Species Program.	Wetland 3-5 connected to this system from the south. No change since 2012.

Wetland I.D.	Resource Areas ¹	Wetland Type ²	Soil Type ³	Notes	2017 Update
Wetland No. 4 2012	BVW	PSS1, PEM1	Canton	This wetland is primarily scrub/shrub and emergent wetland. Dominant species include Pussy Willow, Blue Vervain, Woolgrass, and Tussock Sedge. Groundwater and surface runoff flow in the direction of the drainage channel adjacent to the existing T-hangers.	There has been recent development to the north and west of this wetland. The developments have not affected the wetland as described.
S 2018 2001	BVW	R4	NA	This is a drainage channel which circles the T-hangar facility. Several existing wetlands drain into this system. Vegetation is unknown at this point. There is a culverted inlet located at the northeast corner and northwest corner of the T-hangers.	This was delineated in 2001 and 2018.
Y 2012	BVW	PEM1	NA	Small isolated wetland area identified as having been delineated in March 2012. Vegetation unknown.	This was delineated in March 2012.
Notes: 1. Massachusetts WPA Resource Areas (310 CMR 10.00): RA - 200 Foot Riverfront Area BVW - Bordering Vegetated Wetland Bank - Bank (Land which abuts and confines a water body) LUWB - Land Under Water Bodies Waterways ILSF - Isolated Land Subject to Flooding Isolated Wetland is hydrologically isolated (Not a Massachusetts WPA Resource Area) 2. Wetland Type (Cowardin et al, 1977) PFO 1 - Palustrine Forested/Broad-Leaved Deciduous PFO 4 Palustrine Forested/Needle-Leaved Evergreen PSS 1 - Palustrine Scrub-Shrub/Broad-Leaved Deciduous PEM 1 - Palustrine Emergent/Persistent PUB - Palustrine Unconsolidated Bottom (unvegetated wetland) R3 - Riverine (perennial) R4 - Riverine (intermittent) B - Beaver Influenced 3. Soil Series Mapped by USDA SCS (Middlesex Conservation District, 1986) Source: 2014 Hanscom Field Vegetation Management Plan ; 2014 Jet Aviation Draft Environmental Assessment					

The wetland resources at Hanscom Field have been delineated many times over the past 20 or more years as part of various airport facility and infrastructure improvement projects.

Additional site-specific reviews have been conducted under VMP, SWPP, and drainage planning.

The naming and mapping convention used in previous ESPRs and other planning documents

Wetland delineations are conducted on a project-specific basis and include the following:

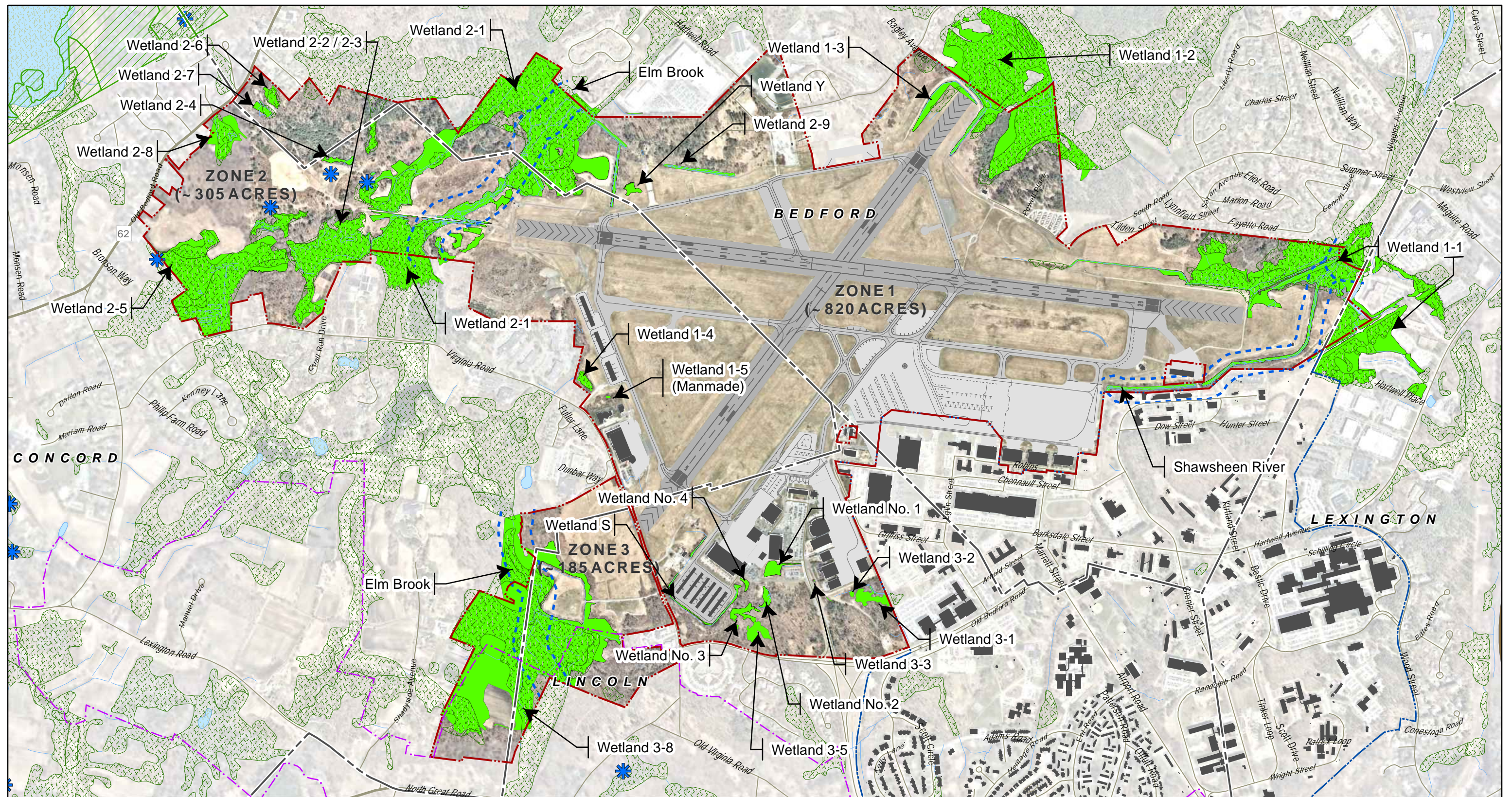
- ⇒ 1998 – MPA
- ⇒ 2001 – Dufresne-Henry, Inc.
- ⇒ 2008 – McFarland Johnson
- ⇒ 2010 – Stantec
- ⇒ 2011 – McFarland Johnson
- ⇒ 2012 – Wetlands & Wildlife, Inc.
- ⇒ 2016 – McFarland Johnson
- ⇒ 2016 – GZA
- ⇒ 2017 – McFarland Johnson
- ⇒ 2018 – Stantec

has been retained to ensure a consistent means to evaluate the known wetland resources at Hanscom Field. Except where noted, the wetland descriptions provided in Table 9-1 remain applicable to the updated wetlands. For the most recent wetland surveys, updated information is provided in Table 9-1. Delineations undertaken since the 2012 *ESPR* were project-specific and included small elements of larger systems previously delineated in 2012. These boundaries were incorporated into the wetland systems depicted shown in Figure 9-1. The jurisdictional determination for four delineated bordering vegetated wetlands (wetlands No. 1 through No. 4) was approved by the Lincoln Conservation Commission through an Advanced Notice of Resource Area Delineation (ANRAD) in 2012. Previously delineated wetlands (3-4 and 3-5) in

proximity to these four wetlands were considered non-jurisdictional; the jurisdiction of these areas, as well as any other wetlands on Hanscom Field, will be re-evaluated if any development or other activity is proposed within or adjacent to these locations.

The boundaries and regulatory status of the wetlands beyond the vegetation management areas would be subject to review and approval by the applicable conservation commission(s) through the submission of appropriate applications under the Massachusetts WPA for any future proposed work within a jurisdictional area.

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- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Great Meadows National Wildlife Refuge Boundary
- Minute Man National Park Boundary

- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service

- Stream
- Open Water
- MA DEP Wetland/Marsh 2018
- Delineated Wetland/Marsh (2012 and Older)
- ✱ NHESP Certified Vernal Pool Updated 2018
- 200-foot Riverfront Area



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Wetlands Location Map

Data Sources: MassGIS 2018; NeoMap 2018; MassPort

Figure 9-1



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9.2.3 Vernal Pools

Three vernal pools have been certified at Hanscom Field outside of the existing airfield. Based on a review of NHESP 2018 GIS data, there are no changes to these resources since 2012. Additionally, no new vernal pools have been certified and no previously-existing certified vernal pools have been removed since 2012. These three vernal pools (within Wetlands 2-4 and 2-5), are located within the Town of Concord to the west of Runway 11/29, and are shown on Figure 9-1. A fourth area with potential vernal pool characteristics occurs within Wetland 2-3 in the same vicinity as the three certified vernal pools in Concord. During 2012 wetland delineations, characteristics of certified vernal pools were identified in wetlands No. 3 and No. 4. However, these areas have not been certified by the NHESP. A plan to protect the certified vernal pools during vegetation management operations was developed as part of the current Hanscom Field VMP.

9.2.4 Perennial Streams

Two perennial waterways exist at Hanscom Field: the Shawsheen River in Bedford and Elm Brook in Bedford, Concord, and Lincoln. The USGS topographic map (Maynard Quadrangle, 1987) indicates that both the Shawsheen River and Elm Brook are perennial waterways. Elm brook is tributary of the Shawsheen River. Additionally, the Massachusetts WPA specifically states that the entire length of the Shawsheen River, a major river, has an associated Riverfront Area. As such, both the Shawsheen River and Elm Brook have a 200-foot wide Riverfront Area extending landward from each Bank within which work is subject to regulation under the Massachusetts WPA. There have been no changes to these resources since 2012. Hanscom Field is located in the upper reaches of the Shawsheen River watershed, and comprises small areas with basin nos. 15002 and 15005.

9.2.5 Vegetation and Wildlife

Native vegetation in the vicinity of Hanscom Field is composed of a mixture of hardwood-forested uplands and wetlands with scattered softwoods, upland and wetland shrub stands, and mowed grasslands. Wetlands including forested swamps, shrub swamps, emergent marshes, and streams are situated around much of the perimeter of Hanscom Field. The airport infield areas are grasslands mowed regularly to maintain operational safety.

The variety of vegetative cover types, presence of wetlands and waterways, and undeveloped parcels on and in the vicinity of Hanscom Field provide known and potential habitat for wildlife species capable of coexisting with human activities and development, but can sometimes pose a hazard to aircraft operations and thus require appropriate management. Wildlife that may be expected to inhabit the area includes larger mammals such as whitetail deer and red fox, and smaller mammals such as eastern cottontail rabbit, gray squirrel, and various species of mice, voles, and shrews.

Characteristic bird species that would typically populate such habitat include various insectivorous and seed-eating passerines, ground-oriented species such as woodcock, and predators such as hawks. According to the Cornell Laboratory of Ornithology, a total of 139 species of birds have been recorded by birders in an around Hanscom Field. Various reptiles and amphibians may be expected to occupy portions of the property as well. Perennial watercourses (i.e., Elm Brook and Shawsheen River) around the periphery of Hanscom Field are Class B surface waters according to Massachusetts Surface Water Quality Standards (314 Code of Massachusetts Regulations, Section 4.05), suitable as "habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation".¹⁴⁴

State Rare and Endangered Species

Portions of Hanscom Field are situated within an area identified by the NHESP as a Priority Habitat of Rare Species and are shown on Figure 9-2. Pursuant to the Massachusetts Endangered Species Act¹⁴⁵ and implementing regulations¹⁴⁶, all state agencies are required to "review, evaluate, and determine the impact to endangered, threatened, or special concern species or their habitats for all works, project, or activities conducted by them."

Work within mapped Estimated Habitat of Rare Species (a subset of Priority Habitat within the jurisdiction of the WPA) or certified vernal pools would need to be reviewed by the NHESP through the submission of a copy of a Notice of Intent prepared as part of the WPA and National

Implementing regulations for the Massachusetts Endangered Species Act define three categories of species [321 CMR 10.03(6)]:

- ⇒ Endangered: "any species of plant or animal in danger of extinction throughout all or a significant portion of its range, and species of plants or animals in danger of extirpation as documented by biological research and inventory."
- ⇒ Threatened: "any species of plant or animal likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and any species declining or rare as determined by biological research and inventory and likely to become endangered in the foreseeable future."
- ⇒ Special Concern: "any species of plant or animal which has been documented by biological research and inventory to have suffered a decline that could threaten the species if allowed to continue unchecked or that occurs in such small numbers or with such a restricted distribution or specialized habitat requirements that it could easily become threatened within Massachusetts."

¹⁴⁴ Code of Massachusetts Regulations (CMR) Title 314, Massachusetts Surface Water Quality Standards. Section 4.05 (3) (b). <https://www.mass.gov/regulations/314-CMR-400-massachusetts-surface-water-quality-standards>.

¹⁴⁵ Massachusetts General Laws, Part I, Title 19, Ch. 131A. <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIX/Chapter131A>.

¹⁴⁶ Code of Massachusetts Regulations Title 321, Massachusetts Endangered Species Act. Section 10.05. <https://www.mass.gov/regulations/321-CMR-1000-massachusetts-endangered-species-act>.

Environmental Policy Act (NEPA) filing process for work in or near wetlands.

As listed in Table 9-2, there are four species identified as state endangered or threatened that have been observed at Hanscom by the NHESP or others or for which priority or estimated habitats (or portions thereof) are mapped on or adjacent to Hanscom Field.

Table 9-2 State Endangered, Threatened, or Special Concern Species at Hanscom Field

Common Name	Scientific Name	MA State Status ¹	Location of Habitats in Relation to the Airfield
Avifauna (Birds)			
Upland Sandpiper	<i>Bartramia longicauda</i>	Endangered	Within the airfield
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Threatened	Within the airfield
Herpetofauna (Reptiles & Amphibians)			
Blanding's Turtle	<i>Emydoidea blandingii</i>	Threatened	Outside of but adjacent to the west end of the airfield property
Wood Turtle	<i>Glyptemys insulpta</i>	Special Concern	Within the airfield
Notes: 1. In accordance with the Massachusetts Endangered Species Act (M.G.L. Ch. 131A) and regulations (321 CMR 10.03) Source: Natural Heritage and Endangered Species Program, August 24, 2018 letter			

Avifauna

The known bird species have remained the same since the 2000 *ESPR*. Both the Upland Sandpiper and the Grasshopper Sparrow require grassland habitat (e.g. hayfields and pastures), such as those found adjacent to airfields. Both Species have previously been observed within several areas of maintained grassland vegetation between runways and taxiways at Hanscom Field, and nesting by these two species was confirmed during past field surveys. The specific locations of nesting pairs of these species have varied somewhat over the years based on previous Massachusetts Audubon Society observations at Hanscom Field.

Herpetofauna

The Blanding's Turtle requires a variety of wetland and terrestrial habitat, including marshes, scrub-shrub wetlands, and open uplands. The Wood Turtle requires riparian areas, such as stream bottoms and banks. During the spring and summer, Wood Turtles will spend time in mixed or deciduous forests, fields, and wet meadows. Fact sheets obtained from the NHESP for all four species are included in Appendix F. The priority habitats for all MA NHESP is depicted in Figure 9-2.

Federal Rare and Endangered Species

Species listed under the Federal Endangered Species Act as Threatened or Endangered would also automatically be protected by the Massachusetts Endangered Species Act. The United States Fish and Wildlife Service (USFWS) has jurisdiction over protection of terrestrial and aquatic (i.e., non-marine) species that are listed and therefore protected under the Federal Endangered Species Act. The potential occurrence of federally listed threatened and endangered species on the Hanscom Field property was evaluated using the United States Fish and Wildlife Service (USFWS) online Information for Planning and Conservation (IPaC) system (USFWS, 2018). The results of the USFWS IPaC query indicate that the range of the Northern Long-eared Bat (NLEB) (*Myotis septentrionalis*, Threatened) overlaps the Hanscom Airfield property and therefore impact to this species should be considered in future activities on the property that result in tree disturbance. NLEBs spend winter hibernating in caves and mines, called hibernacula. During the summer, NLEBs roost singly or in colonies underneath tree bark, in tree cavities or in crevices of both live trees and dead trees.

The species is generally associated with old-growth forests with an intact forest interior habitat.¹⁴⁷ Males and non-reproductive females may also roost in caves and mines where it is cooler. This species of bat has also been found roosting in structures, like barns and sheds, though rarely. The NLEB population in the northeast has been greatly impacted by the spread of *Pseudogymnoascus destructans*, a fungal pathogen that causes a respiratory disease in bats known as “white-nose syndrome.” Massachusetts is wholly within the white-nose syndrome zone.

In January 2015, the USFWS issued a Final 4(d) Rule under the federal Endangered Species Act (ESA) for the NLEB. Under the Rule, focused, rather than broad, protections were provided to the species, emphasizing its vulnerable habitat areas, specifically known hibernacula and maternity roost trees within white-nose syndrome affected counties. USFWS directs project proponents to consult with state Natural Heritage Inventory databases to obtain records of known hibernacula and maternity roost trees. The Massachusetts NHESP maintains these records for municipalities in the Commonwealth. According to their records, there are no caves or mines on, or within ¼-mile of Hanscom Field, nor do any within the towns of Lexington, Concord, Lincoln, and Bedford this species (see Attachment A). There are no Massachusetts NHESP records of known maternity roost trees within the project area or the surrounding area.

Other Species of Conservation Concern

In the past, there have been observations of other grassland bird species of interest at Hanscom Field co-occurring with the Upland Sandpiper and Grasshopper Sparrows. These included the American Kestrel, Bobolink, and Eastern Meadowlark. According to the Massachusetts Wildlife Action Plan (MAWAP), the American Kestrel is a Regional Species of Greatest Conservation

¹⁴⁷ U.S. Fish and Wildlife Service. April 2015. *Northern Long-Eared Bat (Myotis septentrionalis) Fact Sheet*. <https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/NLEBFactSheet01April2015.pdf>.

Need with a high priority for conservation (RSGCN – high priority), while the Bobolink and Eastern Meadowlark are RSGCN concern species of very high priority.

The shrub stands at Hanscom Field provide habitat for five bird species with declining populations, presented in Table 9-3 below. While Massport understands the value of habitat protection under federal law, the airport's primary responsibility is to maintain aviation safety. When habitat management can be implemented in compliance with federal safety standards, Massport will continue to strive to achieve balance between those objectives.

Table 9-3 Bird Species of Conservation Concern Inhabiting Hanscom Shrub Stands

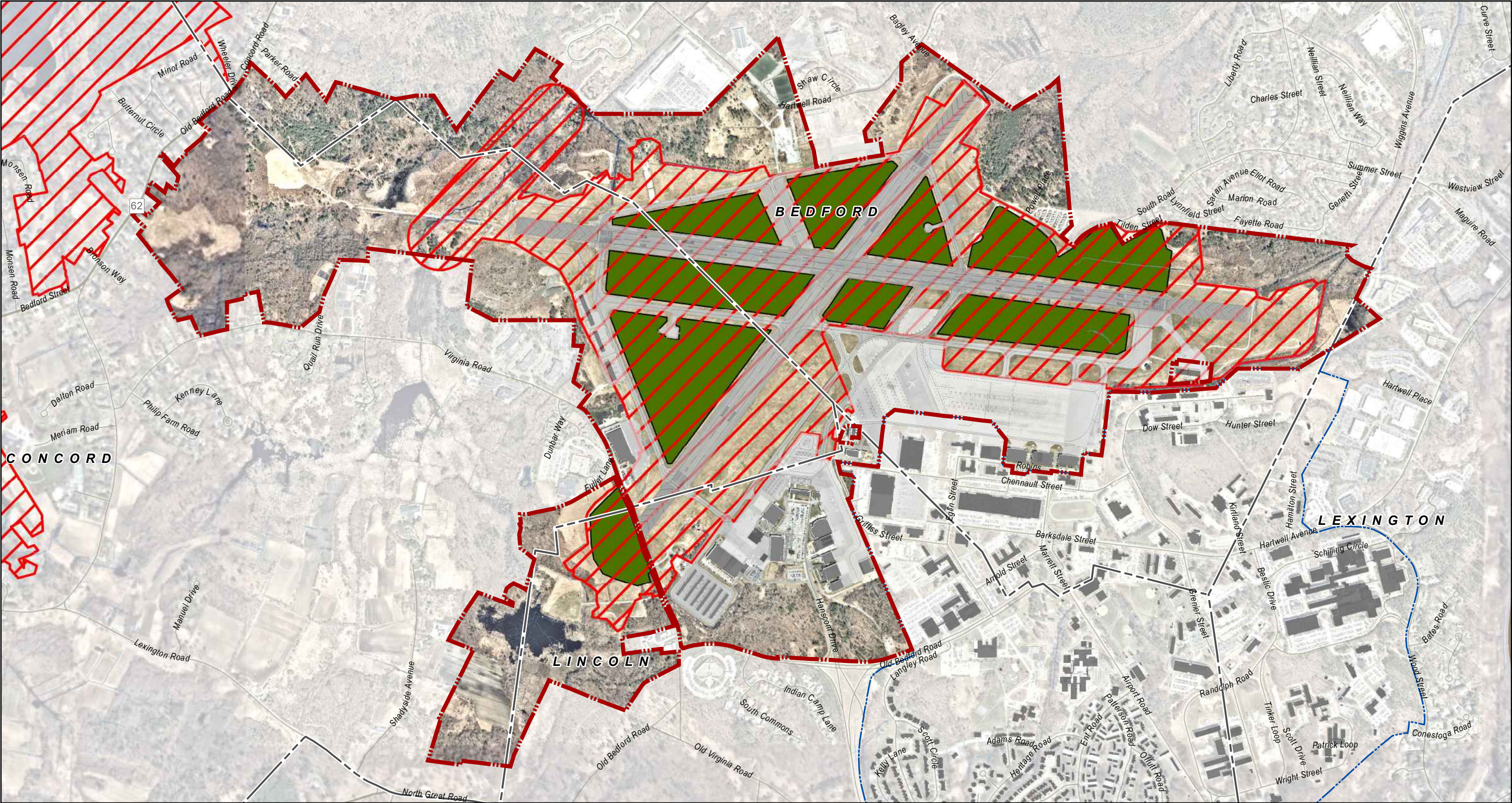
Common Name	Scientific Name	State or Regional Concern and associated Priority ¹
Field Sparrow	<i>Spizella pusilla</i>	MAWAP – RSGCN concern – very high
Brown Thrasher	<i>Toxostoma rufum</i>	MAWAP – RSGCN concern – very high PIF Watch List Species
Prairie Warbler	<i>Setophaga discolor</i>	MAWAP – RSGCN concern – very high PIF Watch List Species BCC for BCR 30 (USFWS, 2008)
Indigo Bunting	<i>Passerina cyanea</i>	RSGCN responsibility – high RSGCN concern – very high PIF Watch List Species
Blue-winged Warbler	<i>Vermivora cyanoptera</i>	BCC for BCR 30 (USFWS, 2008)
Source: .S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, VA. 85 pp. [Online version available at http://www.fws.gov/migratorybirds/]		

Wildlife Hazards to Aircraft

Massport must balance the maintenance of wildlife habitat with protection of public safety. In response to increasing concern about the risk of aircraft strikes associated with certain wildlife species, the FAA issued an Advisory Circular (AC) on Hazardous Wildlife Attractants on or near Airports (AC 150/5200-33B) to provide guidance on land uses that have the potential to attract wildlife that pose hazards (the FAA released a draft update to this document in January of 2019, AC 150/5200-33C). The FAA also maintains a wildlife strikes database and provides guidance to pilots on reporting strikes to gather more information about the number of strikes and species that pose the greatest risk to life and property.

The National Wildlife Strike Database is also a source of information on wildlife that occur at particular airports. Table 9-4 provides a list of wildlife strikes that have been reported at Hanscom Field between September 1990 and January 2018. A total of 240 strikes have been recorded during that time though not all strikes include a confirmed wildlife species.

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- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary

- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service

- Hanscom Hydrology
- NHESP Priority Habitats of Rare Species
- Grassland Management Area



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**Massachusetts Natural Heritage
and Endangered Species Program
Priority Habitat**



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Table 9-4 Species Reported in the National Wildlife Strike Database at Hanscom Field 1990-2018

Common Name	Scientific Name	Animal Category	Number of Strikes
Unknown sp. (small)		Bird	35
American Kestrel	<i>Falco sparverius</i>	Bird	26
Barn Swallow	<i>Hirundo rustica</i>	Bird	15
Mourning Dove	<i>Zenaida macroura</i>	Bird	15
Unknown sp. (medium)		Bird	14
European Starling	<i>Sturnus vulgaris</i>	Bird	11
Tree Swallow	<i>Tachycineta bicolor</i>	Bird	10
Eastern Meadowlark	<i>Sturnella magna</i>	Bird	9
Gulls	<i>Laridae (family)</i>	Bird	9
Killdeer	<i>Charadrius vociferous</i>	Bird	8
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Bird	6
Chimney Swift	<i>Chaetura pelagica</i>	Bird	5
Ducks	<i>Anatidae (Family)</i>	Bird	5
Horned Lark	<i>Eremophila alpestris</i>	Bird	5
Snow Bunting	<i>Plectrophenax nivalis</i>	Bird	5
Bank Swallow	<i>Riparia</i>	Bird	4
Bobolink	<i>Dolichonyx oryzivorus</i>	Bird	3
Canada Goose	<i>Branta canadensis</i>	Bird	3
Hawks	<i>Buteo sp., Accipiter sp.</i>	Bird	3
Striped Skunk	<i>Mephitis</i>	Mammal	3
Swallow sp.	<i>Hirundinidae (family)</i>	Bird	3
Unknown sp. (not otherwise specified)		Bird	3
American Crow	<i>Corvus brachyrhynchos</i>	Bird	2
Crows	<i>Corvus spp.</i>	Bird	2
Great Horned-Owl	<i>Bubo virginianus</i>	Bird	2
Least Sandpiper	<i>Calidris minutilla</i>	Bird	2
Peregrine Falcon	<i>Falco peregrinus</i>	Bird	2
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Bird	2
Sparrows	<i>Passeridae (family)</i>	Bird	2
Unknown sp. (large)		Bird	2

Common Name	Scientific Name	Animal Category	Number of Strikes
American Golden-Plover	<i>Pluvialis dominica</i>	Bird	1
American Pipit	<i>Anthus rubescens</i>	Bird	1
American Robin	<i>Turdus migratorius</i>	Bird	1
Big Brown Bat	<i>Eptesicus fuscus</i>	Bat	1
Black-Bellied Plover	<i>Pluvialis squatarola</i>	Bird	1
Blackpoll Warbler	<i>Setophaga striata</i>	Bird	1
Black Duck	<i>Anas rubripes</i>	Bird	1
Budgerigar	<i>Melopsittacus undulatus</i>	Bird	1
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Bird	1
Coyote	<i>Canis latrans</i>	Mammal	1
Dark-eyed Junco	<i>Junco hyemalis</i>	Bird	1
Eastern Bluebird	<i>Sialia sialis</i>	Bird	1
Geese	<i>Anatidae (family)</i>	Bird	1
Great Blue Heron	<i>Ardea herodias</i>	Bird	1
Gulls/Terns/Kittiwakes	<i>Laridae/Sternidae /Laridae (family)</i>	Bird	1
Herring Gull	<i>Larus argentatus</i>	Bird	1
Mallard	<i>Anas platyrhynchos</i>	Bird	1
Ring-billed Gull	<i>Larus delawarensis</i>	Bird	1
Sandpipers	<i>Scolopacidae (family)</i>	Bird	1
Semi-palmated Plover	<i>Charadrius semipalmatus</i>	Bird	1
Short-billed Dowitcher	<i>Limnodromus griseus</i>	Bird	1
Snowy Owl	<i>Bubo scandiacus</i>	Bird	1
Swainsons Thrush	<i>Catharus ustulatus</i>	Bird	1
Turkey Vulture	<i>Cathartes aura</i>	Bird	1

Status of Vegetation Management Plan

Massport routinely develops Vegetative Management Plans (VMP) in order to comply with FAA regulations and Massachusetts General Laws regarding protected airspace. Massport developed a comprehensive VMP in 2004, which was updated first in 2008, and then again in 2014; the next scheduled update is in 2019. The 2014 update served as a guide for vegetation removal projects conducted at the airport for management years 2014 through and including 2018. Notices of Intent (NOIs) were submitted to the Conservation Commissions of Bedford, Concord, Lexington and Lincoln under the limited project provisions of the Massachusetts WPA

for airport vegetation removal [310 CMR 10.53(n)]. The NOIs were for Phase 1 of the 2004, 2009, and 2014 VMP updates for each town. They clearly described the elements of the VMP and proposed mitigation.

Massport received Orders of Conditions from the Bedford, Concord, Lexington, and Lincoln Conservation Commissions. The initial phase of the VMP was completed in 2004. In accordance with the environmental permits, most of the work was completed while the ground was frozen; work in remaining areas was completed in the spring and fall.

Work associated with the VMP within or adjacent to the three certified vernal pools in Concord was reviewed by the NHESP through the submission of a copy of the NOIs prepared under the Massachusetts WPA for work in or near wetlands. A plan to protect the certified vernal pools during vegetation management operations is incorporated in the VMP, and will continue to be addressed in subsequent updates.

Massport performed a new obstruction analysis for the airport in 2007 as part of its five year VMP update. The 2007 aerial photogrammetric mapping of all four runways concluded the following:

- ⇒ The first Five Year VMP had minimized the need for additional vegetation removal in the areas that had removal in 2004;
- ⇒ Vegetation removal was required in areas that were not part of the first five year VMP; and
- ⇒ Using the FAA-approved 20:1 approach surfaces for Runway 23, there were obstructions in Bedford's Jordan Conservation Area (JCA), but no obstructions in the Bedford Hartwell Town Forest.

A 34:1 approach surface analysis was initially prepared by Massport for the Runway 23 end, as required by the FAA. In response to Massport and community concerns regarding the extent of vegetation removal needed to maintain a 34:1 surface off-airport in the Bedford Hartwell Town Forest and the JCA, Massport worked with the FAA and prepared a 20:1 approach surface analysis. Based on this 20:1 approach surface analysis, FAA agreed that required safety margins could be maintained while reducing impact on the JCA and eliminating all impacts on the Bedford Hartwell Town Forest.

These conclusions were used to develop the second Five Year VMP (2009-2013), which was submitted to the four towns' Conservation Commissions along with NOIs for the required vegetation removal in wetland areas on Massport property. Vegetation removal began in 2009 following the receipt of Orders of Conditions from the towns' Conservation Commissions. The Orders of Conditions required that wetland work be conducted in frozen or dry ground conditions.

Shortly after the 2009-2013 VMP update received its Order of Conditions, Massport worked with the Town of Bedford to develop an agreement to remove obstructions from the JCA. As part of this agreement, Massport made available trails across its property to facilitate trail connections between Bedford and Concord conservation lands. The planned vegetation

removal was completed in 2011, and also included the removal of several obsolete obstruction light poles at the end of Runway 23. By February of 2011, all obstructions identified in the 2007 airspace analysis had been removed. Throughout 2012, Massport continued with maintenance of vegetation removal areas and the trail system, which was opened in September 2011. In 2012, Massport also performed aerial photogrammetric mapping of the airport to generate data to inform the successive VMP update prepared in 2014 for management years 2014 to 2018.

Soon after the 2012 ESPR was completed, Massport began development of the 2014-2018 VMP. The update was based on analysis of the findings from the 2012 aerial photogrammetric mapping of the airport. Monitoring of VMP results since 2008 helped to inform the alternatives analyses of the 2014-2018 VMP update which was put in place since the 2012 ESPR. The update included revisions in various vegetation management areas (VMAs) that reflected changes in the vegetation cover from past management actions, revised strategies for future management, and appropriate best management practices (BMPs) to be applied at each VMA. An example of strategies that were eliminated from consideration included helicopter removal of mature tree penetrations where such penetrations occurred in wetland areas inaccessible to heavy equipment (a strategy that was replaced by the top and girdle alternative).

Sixteen VMAs were identified in the previous VMP. The 2014-2018 VMP update added five more VMAs (VMAs 17, 18, 19, 20, and 21) to be addressed during the plan period. They are summarized as follows:

- ⇒ **VMA 17** – An area associated with Runway 23 that contained penetrations from trees growing in wetland and upland areas associated with the Jordan Conservation Area in Bedford. Penetrations addressed by the Top-and-Girdle method with subsequent invasive species control in selected areas.
- ⇒ **VMA 18** – An area associated with Runway 23 that contained penetrations from trees growing in wetland and upland areas associated with the Jordan Conservation Area in Bedford. Penetrations addressed by the Cut and Chip method with subsequent invasive species control in selected areas.
- ⇒ **VMA 19** – An upland area associated with Runway 11 in Concord. Penetrations addressed by Selective Mechanized Felling with subsequent foliar treatment and invasive species control in selected areas.
- ⇒ **VMA 20** – An area associated with Runway 5 that contained penetrations from trees growing in an upland area associated within and adjacent to the Minute Man National Historic Park in Lincoln. Penetrations addressed by the Top-and-Girdle method with subsequent invasive species control in selected areas.
- ⇒ **VMA 21** – An area associated with Runway 23 that contained penetrations from trees growing in upland areas associated with private, residential properties adjacent to the Jordan Conservation Area (VMA 17) in Bedford. Penetrations addressed by the Top-and-Girdle method.

The 2014-2018 VMP update was submitted to the four towns' Conservation Commissions along with Notices of Intent for the required vegetation removal in wetland areas. The Orders of Conditions for vegetation removal in wetland areas was issued by all four towns' Conservation Commissions after which Massport continued obstruction mitigation in 2015 using the recommendation in the 2014-2018 VMP update and in accordance with the Orders of Conditions.

Obstructions were removed from all four runway ends in 2016 in accordance with the 2014-2018 VMP update and results were subjected to monitoring studies. In 2017, Massport continued to mitigate obstructions using the recommendations in the 2014-2018 VMP update. The next scheduled update, the 2019-2023 VMP Update, is currently being developed and will include updated aerial mapping.

Grassland Management Plan

Areas of Hanscom Field are mapped as Priority Habitat under the Massachusetts Endangered Species Act. Many of these areas require regular mowing as required by the FAA to meet aviation safety standards. In 2004, Massport developed a Grassland Management Plan, the goal of which is to provide safe operating conditions at Hanscom Field while protecting rare grassland bird species such as the Grasshopper Sparrow and Upland Sandpiper. The plan was finalized with input from the U.S. Department of Agriculture/Wildlife Services (USDA), FAA, and the NHESP. There are no recent changes to the Plan.

The Grassland Management Plan includes the following guidelines for maintenance of portions of the grass infield areas between runways and taxiways at Hanscom Field as well as selected grassed approach areas.

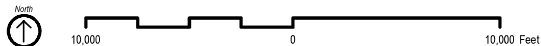
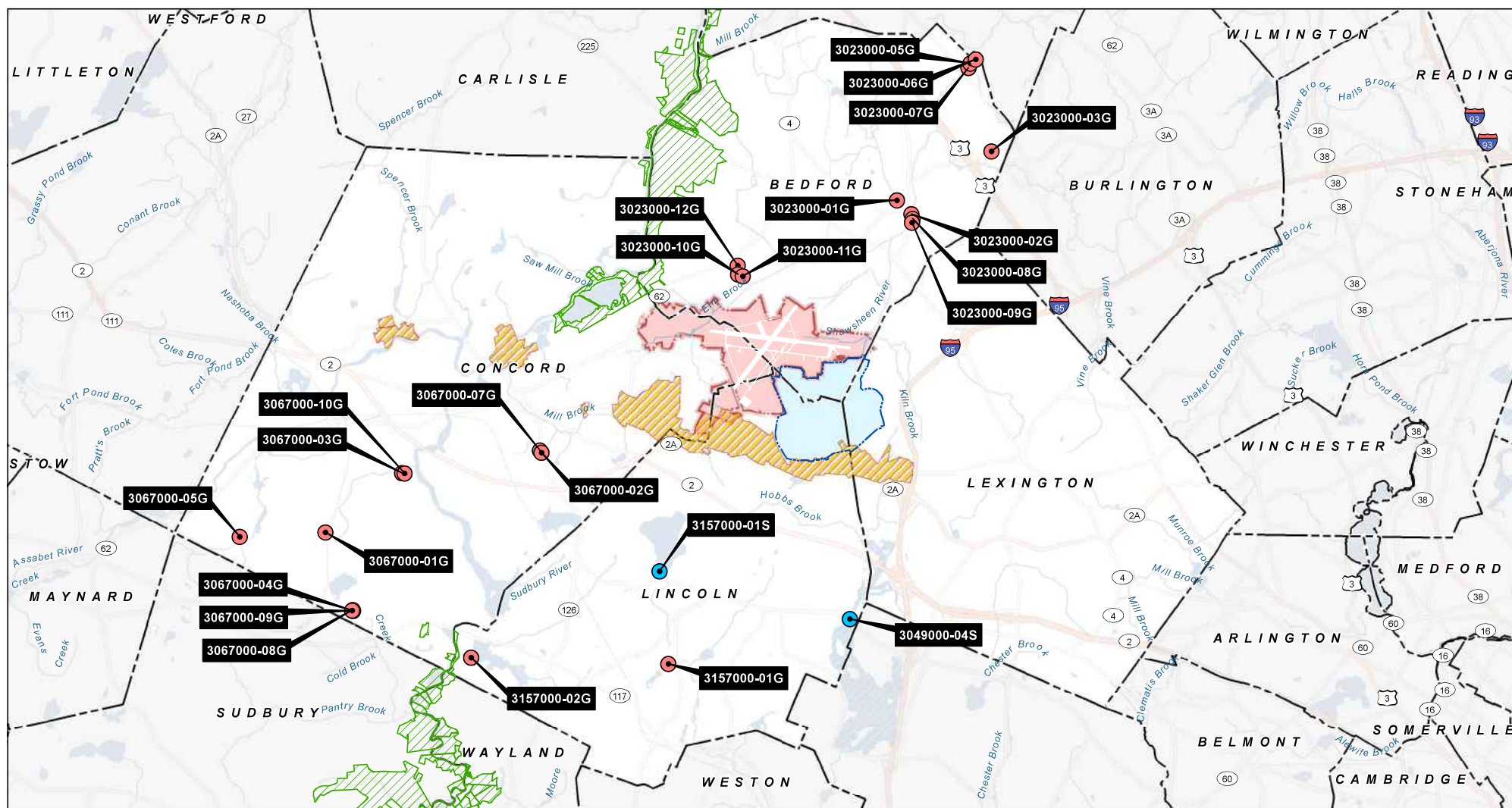
- ⇒ Conduct annual pre-breeding season review of grassland management procedures and protected grassland birds identification (Upland Sandpiper and Grasshopper Sparrow) with operations staff.
- ⇒ Develop a plan of the managed areas.
- ⇒ Develop an annual mowing schedule that would maintain managed grassland areas at a height of four to 14 inches.
- ⇒ Mow runway and taxiway areas prior to May 1, when feasible, to avoid conflicts with breeding season.
- ⇒ Maintain mowed strips along runways (250 feet from runway centerlines) and taxiways (85 feet from taxiway centerline) throughout the breeding season to discourage birds from nesting in these areas.
- ⇒ Restrict mowing during the breeding (nesting and brood-rearing) season (May 1 to July 31) on designated portions of the airfield not directly adjacent to runways and taxiways.
- ⇒ Conduct pre-mowing field reconnaissance to observe and mark locations of nesting birds in "critical areas" along runways and taxiways.
- ⇒ Inspect grassland management areas for young prior to mowing.

- ⇒ Avoid, as practical, activities on grassland portions of the airfield and approach area not directly adjacent to runways and taxiways during breeding season (May 1 to July 31).

If, after implementation of these recommendations, there is a documented increase in wildlife hazards, bird strikes, or other safety issues, the plan will be modified. NHESP would be notified of any modifications of the plan and the process will involve timely notification of the Conservation Commissions in Bedford, Concord, Lexington, and Lincoln.

9.2.6 Water Resources

The locations of public water supplies within Bedford, Concord, Lexington, and Lincoln are shown on Figure 9-3. Table 9-5 presents the name, location, type (well or surface water), and community served by each public water supply facility, as well as the approximate distance from the water supply to Hanscom Field. As shown in the table, the municipal water supplies vary in distance from Hanscom Field from 0.9 to 6.8 miles. The only change in the public water resources since the 2012 *ESPR* was removal of a transient well from the list.



- Hanscom Field Property Boundary
- Minute Man National Historic Park
- Hanscom AFB Property Boundary
- Municipal Boundary
- Great Meadows National Wildlife Refuge Boundary

- Interstate
- Highway
- Road
- Active Rail Service

Public Well Locations

- Ground Water Well
- Surface Water Well



**Location of Public Water Supplies
in Bedford, Concord, Lexington,
and Lincoln MA**

Data Sources: MassGIS 2018; NeoMap 2018, MassPort

Figure 9-3

Table 9-5 Public Water Supply in Bedford, Concord, Lexington, and Lincoln

Town ¹	Source ² ID Number	Site Name	Type	Distance from Hanscom Field ³
Bedford	3023000-11G	Well No. 11 (Hartwell Rd. G.P. Well No. 11)	Groundwater	0.9 miles
	3023000-10G	Well No. 10 (Hartwell Rd. G.P. Well No. 10)	Groundwater	0.9 miles
	3023000-12G	Well No. 12 (Hartwell Rd. G.P. Well No. 12)	Groundwater	1.0 miles
	3023000-09G*	Well No. 5 (Shawsheen G.D. Well No. 5)	Groundwater	2.2 miles
	3023000-08G*	Well No. 4 (Shawsheen G.D. Well No. 4)	Groundwater	2.2 miles
	3023000-02G*	Well No. 2 (Shawsheen Rd. G.P. Well No. 4)	Groundwater	2.3 miles
	3023000-01G	Well No. 1 (Page School G.P. Well)	Groundwater	2.3 miles
	3023000-03G	Well No. 3 (MITRE/Rte. 62 G.P. Well)	Groundwater	3.5 miles
	3023000-05G	Well No. 7 (Turnpike G.P. Well No. 7)	Groundwater	4.0 miles
	3023000-07G	Well No. 9 (Turnpike G.P. Well No. 9)	Groundwater	4.0 miles
	3023000-06G	Well No. 8 (Turnpike G.P. Well No. 8)	Groundwater	4.2 miles
Concord	3067000-02G	Hugh Cargill G.P. Well	Groundwater	3.1 miles
	3067000-07G*	Hugh Cargill Wellfield (Replacement)	Groundwater	3.2 miles
	3067000-06G*	Robinson G.P. Well	Groundwater	4.3 miles
	3067000-03G*	Deaconess G.P. Well	Groundwater	4.7 miles
	3067000-01G*	Jennie Dugan Well	Groundwater	5.9 miles
	3067000-04G*	White Pond Well	Groundwater	6.0 miles
	3067000-08G	White Pond Satellite No. 1 GP Well	Groundwater	6.0 miles
	3067000-09G	White Pond Satellite No. 2 GP Well	Groundwater	6.0 miles
	3067000-05G*	Second Division GP Well	Groundwater	6.8 miles

Town ¹	Source ² ID Number	Site Name	Type	Distance from Hanscom Field ³
Concord		Annursnac Hill Reservoir	Surfacewater	
Lincoln	3157000-02G	Farrar Pond GP Well	Groundwater	3.1 miles
	3157000-01S	Flints Pond	Surface Water	3.1 miles
	3049000-04S	Hobbs Brook Res. Upper	Surface Water	3.5 miles
	3157000-01G	Tower Rd. GP Well	Groundwater	5.3 miles
Notes: 1. Lexington is served by the Massachusetts Water Resource Authority and has no municipal water supply resources. 2. MassGIS database (includes currently active and inactive wells). 3. Approximate distances measured from Hanscom Field runway intersection. * active wells				

Most of the Bedford water supply is provided by the Massachusetts Water Resources Authority (MWRA), with the remainder provided by three public water supply wells, which are used primarily during high use (e.g., summer dry seasons). Concord is served by six active public water supply sources. Lexington is served by the MWRA and has no municipal water supply sources, while Lincoln is served by four public water supply sources.

Wellhead Protection Areas, which are also known as Zone II areas, are approved under the MassDEP's Drinking Water Program to protect the recharge area around public water supply ground water sources. The Massachusetts Drinking Water Regulations require that public water suppliers delineate Zone IIs and restrict certain land uses and activities in Zone IIs which may result in the contamination of a groundwater drinking supply. Figure 9-4 shows the approved Zone II Wellhead Protection Area that overlaps Hanscom Field. The Zone II area is associated with three Hartwell Road wells in Bedford: Well #10, Well #11, and Well #12. There are no Surface Water Supply Protection Areas (Zone A, B, C) in Hanscom Field.

Rectrix developed a new above-ground fuel storage facility that was completed in early 2014 adjacent to the existing Jet Aviation current fuel farm. These fuel farms are located outside of the Zone II area. Furthermore, the implementation of the SPCC Plans by Massport and its tenants, and the airport's SWPPP provide additional protections of the groundwater resources. All fuel storage facilities are subject to the regulatory requirements of Title 527 of the CMR, Chapter 9.00, "Board of Fire Prevention Regulations: Tanks and Containers." Massport's Fire Chief required that the new Rectrix fuel farm meet MassDEP regulatory standards applicable to fuel storage.¹⁴⁸ These measures, as well as elements of Massport's spill prevention program, are designed to protect the recharge area of the Bedford public wells.

¹⁴⁸ Code of Massachusetts Regulations. Part I, Title 310, Chapter 22. Drinking Water. Section 21. <https://www.mass.gov/law-library/310-cmr>

9.2.7 Regulated Remediation Sites

Hanscom Field

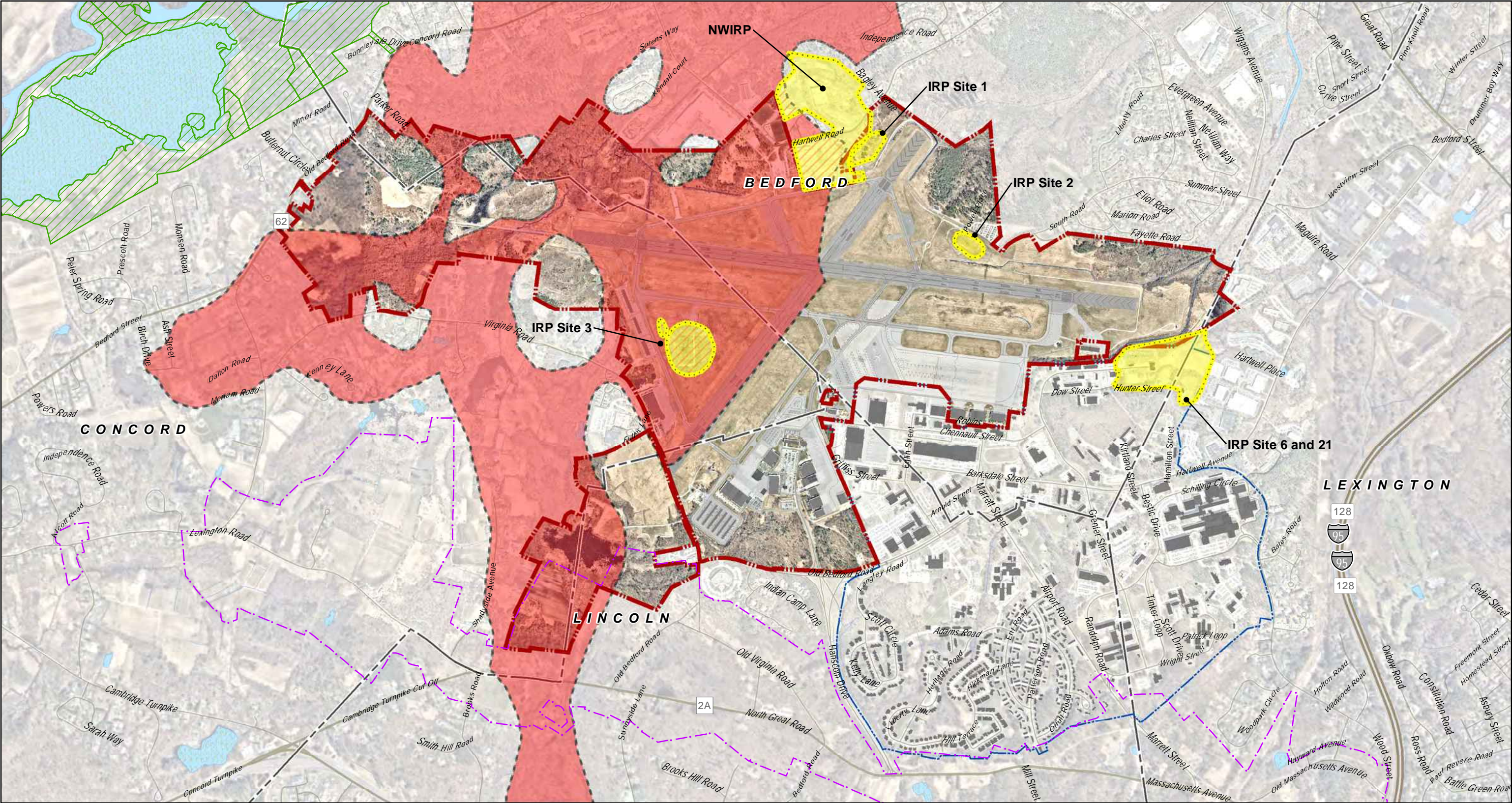
Currently, there are no active MassDEP-listed disposal sites that Massport is responsible for bringing to regulatory closure under the Massachusetts Contingency Plan (MCP). As reported in 2005, there had been only one site, Release Tracking Number (RTN) 3-13953, that was active during the time of the *2005 ESPR*. By 2006, this site had been brought to regulatory closure.

For this document, a search of MassDEP Reportable Releases database was conducted for sites where a release of oil or hazardous material was reported to the MassDEP. Table 9-6 shows a listing of the MassDEP-listed disposal sites for locations at Hanscom Field for which releases were reported since the beginning of 2012.

Table 9-6 2012-2017 MassDEP Reported Releases at Hanscom Field that Reached Response Action Outcome (RAO) Status

RTN	City/ Town	Release Address	Site Name Location Aid	Notification Date	Compliance Status	Date	RAO Class
3-0033376	BEDFORD	380 Hanscom Drive	["JET AVIATION] Apparently incorrect site name entered in MADEP Database	01/20/16	PSNC ¹	04/18/17	PN
3-0033757	CONCORD	777 Virginia Road	L.G. HANSCOM FIELD ⁵	08/18/16	PSNC	09/29/16	PN ³
3-0032985	BEDFORD	380 Hanscom Drive	L.G. HANSCOM FIELD ⁵	06/24/15	PSNC	08/24/15	PN
3-0032635	BEDFORD	380 Hanscom Drive	L.G. HANSCOM FIELD	12/12/14	PSNC	01/26/15	PN
3-0031973	BEDFORD	180 Hanscom Drive	L.G. HANSCOM FIELD	02/04/14	RAO ²	04/15/14	A1 ⁴
3-0031035	BEDFORD	180 Hanscom Drive	L.G. HANSCOM FIELD ⁵	08/10/12	RAO	10/12/12	A1
<p>Notes:</p> <p>1. PSNC (Permanent Solution No Conditions) = A site/release where a Permanent Solution Statement was submitted indicating that response actions were sufficient to achieve a level of No Significant Risk for all current and foreseeable future uses of the site without the need to restrict the use of the property. (Classification used post-2014).</p> <p>2. RAO (Response Action Outcome) = A site/release where a Permanent or Temporary Solution Statement (formerly RAO Statement) was submitted. This statement asserts that response actions were sufficient to achieve a level of no significant risk (for Permanent Solutions) or at least ensure that all substantial hazards (for Temporary Solutions) were eliminated. (Classification used pre-2014).</p> <p>3. PN = Permanent Solution with No Conditions (unrestricted use)</p> <p>4. AI = A permanent solution has been achieved. Contamination has been reduced to background or a threat of release has been eliminated.</p> <p>5. Data has been corrected from what was entered in the MADEP database</p>							

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0 2,000 4,000 Feet

- Hanscom Field Property Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Great Meadows National Wildlife Refuge Boundary
- Minute Man National Park Boundary

- Historic Road
- Interstate
- Highway
- Road
- Trail
- Active Rail Service

- Hanscom Hydrology
- Zone II Wellhead Protection Area
- IRF Site Locations
- IRF Site within Zone II Wellhead Protection Area



L. G. Hanscom Field 2017 Environmental Status & Planning Report

Zone II Wellhead Protection Areas

Data Sources: MassGIS 2018; NeoMap 2018; MassPort

Figure 9-4



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Hanscom Air Force Base

Hanscom AFB maintained and operated Hanscom's airfield until 1974 and retains responsibility for any required clean-up that stems from this time, as well as for any sites on Hanscom AFB property. Hanscom AFB is conducting environmental restoration efforts under the U.S. Air Force Installation Restoration Program (IRP), a federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund")-based program. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is the primary IRP response process for releases identified under this program.

However, because petroleum releases are excluded from the Superfund program, the MCP is the primary IRP response process at the sites where a release of petroleum has occurred. The U.S. EPA is the lead agency for the NCP sites, and the MassDEP is the regulatory agency for the MCP sites.

The objectives of the Hanscom AFB IRP program are generally summarized as the following: protect human health and the environment; characterize risks associated with the release sites; commence restoration as soon as practicable; initiate removal actions as necessary; develop remedial actions as necessary; conduct long term operation and maintenance of remedial systems implemented for cleanup; and comply with all deadlines, commitments, and regulations applicable to the program.

As part of the IRP, initial field investigations commenced in the summer of 1982. The preliminary assessment/site investigation phase of the IRP resulted in the identification of 22 specific sites as areas with the potential for environmental contamination from past waste management practices. Of the 22 sites, seven are located on Massport property. Investigations and appropriate response actions have been completed at 16 IRP Sites and one IRP Area of Concern, and they have been closed out within the applicable regulatory framework. In addition, investigations have been completed and long-term remedies are in place at the six remaining IRP Sites (including three IRP Sites on Hanscom Field).

There have been no additional sites added to the IRP list at Hanscom since the *2012 ESPR*. Figure 9-5 illustrates the location of the remaining active IRP sites/Operable Units (OUs). All of the waste sites identified through the IRP studies have been investigated and, where deemed necessary, have been or are currently being remediated.

Five-Year Reviews of ongoing remedial actions will be conducted as long as any hazardous pollutants or contaminants remain at the site above levels that allow for unlimited and unrestricted exposure as required by CERCLA. The most recent (fifth) "Five-Year Review for the Hanscom Field/Hanscom AFB Superfund Site" was completed in August 2017. Hanscom AFB Records of Decision (RODs), other Decision Documents, including an MCP Licensed Site Professional (LSP) Opinions/Response Action Outcome (RAO) Statements, and Five-Year Review Reports issued for IRP actions are all subject to concurrence from the U.S. EPA and/or MassDEP. Site Close-Out designation indicates that all required actions are complete and the USAF has received concurrence from the regulatory agencies to that effect, as applicable.

Operable Unit 1 / IRP Sites 1, 2, 3

An Interim Record of Decision (IROD) was issued for NPL OU-1 which includes IRP Site 1 (Fire Training Area II), IRP Site 2 (Paint Waste Disposal Area), and IRP Site 3 (Jet Fuel Residue/Tank Sludge Disposal Area) in January 2001 by the USAF, which set forth the requirements for the continued operation of the existing groundwater treatment system, the implementation of institutional controls, and the monitoring of the groundwater and surface water at Hanscom Field/Hanscom AFB. Groundwater beneath OU-1 is contaminated with chlorinated volatile organic compounds (VOCs) as a result of the previous USAF airfield maintenance and training activities, and the remedy includes a vacuum-enhanced recovery (VER) system and groundwater treatment.

The following information was summarized in the fifth "Five-Year Review for the Hanscom Field/Hanscom AFB Superfund Site" prepared by USEPA. According to the fifth Five-Year Review, the OU-1 remedial action has been and continues to be protective of human health and the environment because long-term monitoring confirms that operation of the pump and treat system, in conjunction with supplemental treatment measures in place at the site, is working to prevent further migration of Contaminants of Concern (COCs) in groundwater, and to prevent the discharge to surface water bodies and wetlands of groundwater containing COC concentrations above regulatory criteria. Recent supplemental treatment and optimization measures will continue with the goal of reducing the time it takes to meet the regulatory criteria including EPA Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and Massachusetts Contingency Plan (MCP) standards.

Operable Unit-2 / IRP Site 4

IRP Site 4 was used as the Hanscom AFB municipal waste landfill from December 1964 until December 1974. The site covers 10.5 acres and is located approximately 1,800 feet southeast of the approach end of Runway 5/23 on Hanscom Field. The landfill is situated predominantly in the town of Lincoln, with a small portion protruding into the bordering town of Concord. The landfill ranges from 10 to 15 feet deep and is estimated to have a volume of 210,000 cubic yards of mixed waste from various sources. An impervious cap was placed over the landfill in 1988. The area is also bermed with drainage ditches to channel runoff from the capped area to the wetlands. Today the area is grassed open space with a softball field in the southern half.

According to the data review, site inspections, and interview conducted in late 2016 and 2017, the Fifth Five-Year Review found that the remedy at OU-2/IRP Site 4 remains protective of human health and the environment. The remedy is functioning as intended by the 1988 Remedial Action Plan, the integrity of the low permeability landfill cap is being maintained, and a long-term inspection and maintenance program is in place to ensure continued protectiveness.

Operable Unit 3 / IRP Site 6

This approximately 15-acre site is located in the northeast portion of Hanscom AFB in the towns of Bedford and Lexington. The site is bounded to the north by a former railroad spur, to the northeast by a wetland area and small pond, to the east by a commercial industrial park, to the south by a service road (Hunter Street), and to the west by IRP Site 21 (the former aviation fuel facility).

IRP Site 6 consists of three distinct areas as follows:

- ⇒ The former filter beds (which includes the former sludge beds) and two hillside landfill areas;
- ⇒ The south landfill (including a suspected ash disposal area and Building 1855 Underground Storage Tank [UST] site); and
- ⇒ The west landfill.

The former filter bed area is the original sanitary waste treatment system (used from 1947 until the mid-1950's) for Hanscom AFB before it was abandoned in place and the Base connected to a municipal sanitary waste system. Following the abandonment of the treatment system, this area became a disposal site for municipal wastes, construction debris, and clean fill. As a result, the filter beds were overlain by approximately 5 to 15 feet of solid waste material. Immediately adjacent to, and to the south of the filter bed area are two hillside landfill areas (south and west). Disposal in these two areas was mainly clean fill and/or construction debris.

The south landfill was used for the disposal of building foundation excavation and construction debris in the late 80's/early 90's. The southernmost portion of the south landfill includes a suspected ash disposal area and the former location of a 1,000-gallon No. 2 fuel oil UST on the west side of Building 1855. When the UST was removed in 1990, evidence of a petroleum release was found. Building 1855 formerly housed an incinerator and is currently a licensed solid waste transfer station for Hanscom AFB.

The Remedial Investigation (RI) of the site was completed in 1998 and Human Health and Ecological Risk Assessments were completed in 1999. Taken together, these assessments found potential for future adverse impact to human health and the environment.

Based on the RI and risk assessments a Focused Feasibility Study, Operable Unit 3, Site 6 – Landfill and a Proposed Plan for Hanscom AFB Operable Unit 3/Site 6 were prepared and approved by the Commonwealth. The remedial action remedy (containment and capping, removal of contaminated sediment, and the implementation of engineering and institutional controls) was implemented in September 2001. Immediately following construction of the remedy, a long-term inspection, maintenance and monitoring program commenced to ensure the continued protectiveness of the remedy.

A Five/Thirty Year Monitoring Plan was specified by the Remedial Design (RD) for the wetland areas remediated during the construction phase of the Site 6 Remedial Action. The initial 5-year wetland mitigation monitoring program was successfully completed in 2006. Subsequent wetland mitigation and ecosystem evaluation events were successfully completed in the

ensuing 5-year interval years of 2011 and 2016, with the latter event documenting that the objectives of the initial five-year monitoring plan and long-term operation and maintenance plan have been met. The Five-Year Wetlands Ecosystem Evaluations were thus discontinued as recommended in the 2016 wetland report.

Long-term monitoring data continues to indicate that the surface water quality in the adjacent wetlands and the Shawsheen River are not being adversely impacted by residual groundwater contamination. A Downgradient Investigation was conducted in 2014 and 2015 to determine the source of arsenic detected at and north of the compliance boundary at concentrations above the MCL. The evaluation determined that arsenic concentrations that exceed the MCL beyond the compliance boundary are representative of background concentrations and thus the compliance boundary is adequate as currently delineated.

Groundwater monitoring has detected the compound Pentachlorophenol (PCP) at monitoring well number MW-112U at concentrations reported as "non-detect meaning the reporting limit concentration of the compound (if present in the media being tested) was below a concentration that could be detected by the laboratory instrumentation." However, the laboratory's reporting limit concentrations were above the applicable state regulatory criteria (MCL/MCP GW-1 Standard). This means that it cannot be said with certainty that PCP does not exceed the cleanup standards at that monitoring location. Therefore, it was recommended that subsequent sampling events for PCP require the use of an analytical method that is sensitive enough to achieve a reporting limit below the MCL/ MCP GW-1 Standard.

According to the data review, site inspections, and interviews conducted in late 2016 and 2017, the Fifth Five-Year Review concluded that the remedy at OU-3/IRP Site 6 was protective of human health and the environment.

OU-3/IRP Site 21

IRP Site 21 is an area with groundwater contamination and three separate areas of petroleum products floating on the groundwater table that were identified by the Remedial Investigation. These areas are technically referred to as light non-aqueous phase liquid (LNAPL) pools which means that the liquid contaminant is not dissolved in the water column but remains in a separate phase (i.e., "non-aqueous") and this phase floats atop the groundwater surface because the contaminant's specific gravity is lighter than water. The site is approximately 5 acres in area, situated in the town of Bedford in the northeast portion of Hanscom AFB and adjacent to IRP Site 6. IRP Site 21 is the area of a former aviation fueling facility that was used for storage, off-loading, and dispensing of jet fuel and aviation gasoline from at least 1945 through 1973, and to store and distribute No. 2 fuel oil during the early 1970s. Fuel was stored in aboveground and underground storage tanks, which had associated pump houses and a network of underground piping. This area was also used for the storage of cleaning solvents and other petroleum products (oils and lubricants) associated with aircraft and vehicle maintenance.

Following the discovery of IRP Site 21 in 1990 several interim remedial actions were conducted prior to 2001, to include a RI and risk assessments. These assessments were completed in July 2000. Based on these documents and data gathered during the interim remedial actions, a *Feasibility Study, Operable Unit 3/ Site 21* dated June 2001 and a *Proposed Plan for Hanscom AFB Operable Unit 3/Site 21* dated July 2001 were prepared, and released for public comment (for which the Air Force received none). Subsequently, a Record of Decision, dated October 2001 selecting the remedy for OU3/IRP Site 21 was signed by the Air Force on August 20, 2002 and by the USEPA on August 29, 2002. The Commonwealth of Massachusetts formally concurred with this ROD by letter dated January 22, 2002.

The construction of the final remedy in accordance with the IRP Site 21 ROD commenced in June 2003 and was substantially completed in September 2003. The selected remedial action for cleaning up OU-3/IRP Site 21 (engineered solutions) centered about a 10-well recovery system. While the active recovery system had made progress towards the response action outcome (RAO) to return groundwater to federal and state drinking water standards and state groundwater risk characterization standards within an acceptable time period (<100 years), the recent focus has changed from active remedial efforts to passive in-situ treatment methods, with a goal of achieving a higher rate of contaminant mass destruction. Land Use Controls/Institutional Controls prevent exposure to and use of contaminated groundwater, ensure that excavation at the Site is controlled to prevent exposure to any residual contamination in the subsurface soil or groundwater, and that future land use does not increase the risk of exposure to contaminants remaining on-site.

The current status of the IRP at Hanscom AFB as of 2017 can be found in the following document: <https://semspub.epa.gov/work/01/100000682.pdf>

Naval Weapons Industrial Reserve Plant (NWIRP), Bedford

The NWIRP site is located on 46 acres of land on the north side of the airfield within the Bedford town limits. It is bounded by Hanscom Field and Hanscom AFB to the south; businesses (Instrumentation Laboratory and Edge Sports Center), wetlands, and residences to the west; by forested upland and wetlands to the north; and by woodland, residences, and wetlands to the east. NWIRP Bedford is divided into northern and southern sections that are separated by Hartwell Road.

NWIRP Bedford was established in 1952 and its mission was to design, fabricate, and test prototype equipment for missile guidance and control systems. This facility was involved in active research from the mid-1950s until December 2000 when its mission ended, and the facility was closed. The Navy retains ownership of this property yet the facility – composed of two main structures – the Components Laboratory north of Hartwell Road, and the Southern Flight Test Area Facility to the south– remains closed. It is the intent of the Navy to transfer the southern portion of the facility to the Massachusetts Port Authority for continued aviation-related industrial operations at Hanscom Field

An Initial Assessment Study (IAS) was conducted in 1986 which identified potentially contaminated sites at NWIRP Bedford. Initially four sites were identified for investigation. The results of the IAS led to the placement of NWIRP Bedford on the National Priorities List (NPL) on May 31, 1994. The Navy and U.S. USEPA signed a Federal Facilities Agreement on February 2, 2000 related to conducting investigations at NWIRP Bedford.

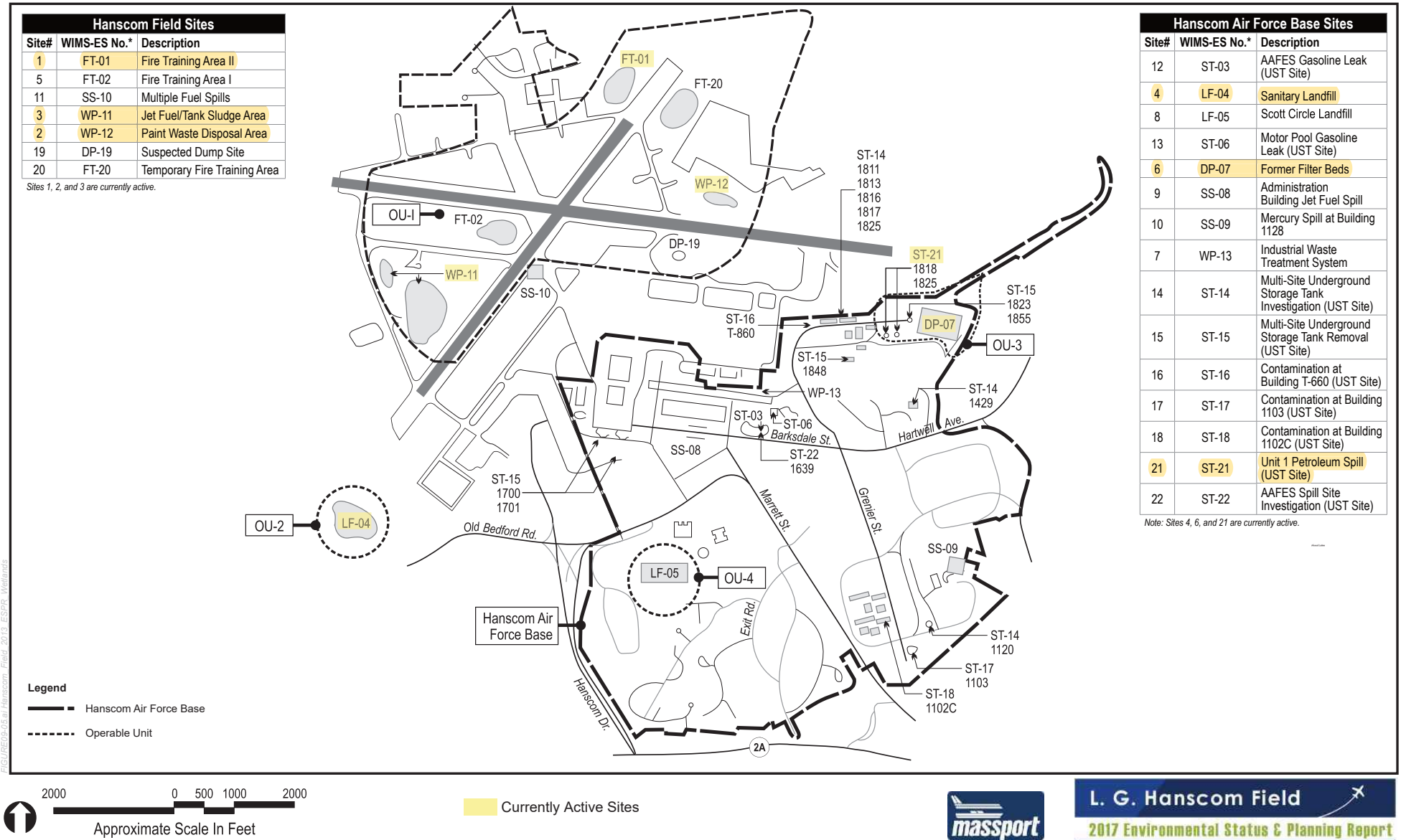
Two sites (Sites 1 and 2) received no further action (NFA) decisions in September 2000. However environmental investigations ensued for over the next two decades at Sites 3 and

4. An interim remedial action (IRA) for Site 3 was initiated in 1997; this IRA consisted of constructing and continually operating a groundwater extraction system to contain a subsurface contaminant plume at Site 3. Additional IRAs were conducted for both Sites 3 and 4 in early 2000s. A decision was reached for Site 4 in 2009 and for Site 3 in 2010.

In 2014, a fifth site (Southern Flight Test Area [SFTA]) was added. Sites 3 and 4; and Site 5 (the SFTA) are all reportedly in the post-decision phase. The Navy will conduct Five-Year Reviews at these three sites while contamination remains in the subsurface.

The Naval Facilities Engineering Command (NAVFAC) reports the following major investigations and studies that have been conducted at NWIRP Bedford to date since the 2012 Environmental Status & Planning Report:

- ⇒ Construction Completion Report for the Remedial Actions at Site 3 and Site 4 (2014);
- ⇒ Explanation of Significant Difference to the Site 3 ROD (Inclusion of Southern Flight Test Area) (2014);
- ⇒ (First) Five-Year Review for Site 3, Southern Flight Test Area, and Site 4 (2014); and
- ⇒ Interim Remedial Action Completion Report for the Southern Flight Test Area (2015).



Data Source: USAF

Installation Restoration Program Sites / Operable Units

Figure 9-5

9.2.8 Stormwater

Massport strives to guide new development to areas of existing impervious surfaces that takes advantage of existing infrastructure to enhance groundwater recharge and minimize runoff.

Chapter 2 Facilities and Infrastructure, presents information about impervious surfaces at Hanscom Field. The following sections describe the stormwater management program for Hanscom Field, including stormwater modeling, stormwater-related permitting and monitoring programs undertaken by Massport.

Massport has undertaken a comprehensive stormwater modeling study, which is being coordinated with the MassDEP for the Shawsheen River watershed. The purpose of the modeling effort is to assess current peak and base flows within the river and to evaluate potential Best Management Practices (BMPs) and stormwater controls to reduce the peak flows and increase base flows.

National Pollution Discharge Elimination System Permit

Airports in the United States, including Hanscom Field, are required to apply for coverage under a Stormwater MSGP in accordance with the NPDES permit program, a part of the federal Clean Water Act.¹⁴⁹ Under this permit program administered by the U.S. EPA, owners and/or operators of airports must satisfy specific requirements for operations conducted at the facility that may affect stormwater quality. Massport applied for coverage under the current MSGP in 2009 and the reissued MSGP in 2015. Tenants who lease property on Hanscom Field and engage in activities covered under the permit program are listed in Table 9-7.

Table 9-7 Massport Tenants Covered under the Hanscom Field NPDES Permit

Tenant	Address
Signature Flight Support	180 Hanscom Drive, Bedford
Jet Aviation	380 Hanscom Drive, Bedford
Rectrix	777 Virginia Road, Concord
Stream Enterprises	140 Hanscom Drive, Bedford
Liberty Mutual	230 Hanscom Drive, Bedford
Nagle Aircraft	145 Hanscom Drive, Bedford
Boston Medflight	Robins Street, Hangar 1727, Bedford
East Coast Aero Club	200 Hanscom Drive, Bedford
North Star Aviation	130 Hanscom Drive, Bedford
Source: Hanscom Field NPDES Permit MAR05CY14; J. Stolecki personal communication)	

¹⁴⁹ Federal Water Pollution Control Act, (33 USC 1251 et seq). <https://www.epa.gov/sites/production/files/2017-08/documents/federal-water-pollution-control-act-508full.pdf>.

The current NPDES Permit Tracking Number is MAR05CY14; the Master Permit Number is MAR050000. The permit effective date was June 4, 2015, and it remains valid for five years. Hanscom Field operates under this MSGP.

Stormwater Pollution Prevention Plan (SWPPP)

Massport updated and revised the Hanscom Field SWPPP in October 2015 in compliance with the Stormwater Multi-Sector General Permit that was reissued under the NPDES in June 2015. As stated in the SWPPP, the responsibilities of Massport and the tenants include the following:

- ⇒ Implementing the policies and procedures (Best Management Practices) presented in the SWPPP for the facilities and operations;
- ⇒ Conducting periodic reviews of policies and procedures to evaluate the effectiveness of the current SWPPP;
- ⇒ Updating the SWPPP and related information whenever there is a significant physical change at the facility and/or a significant change in the operational procedures of a facility that could result in the discharge of toxic or hazardous pollutants to stormwater or an increased risk of such discharge; and
- ⇒ Maintaining records of required inspections, operations, materials use, etc. as required in the SWPPP.

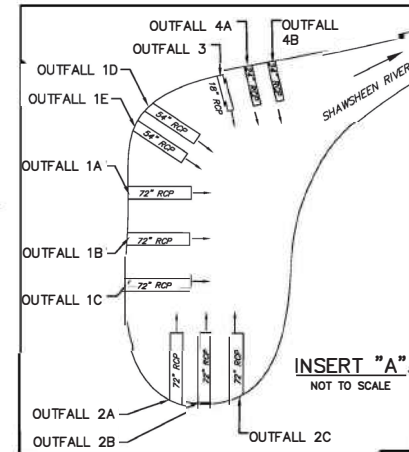
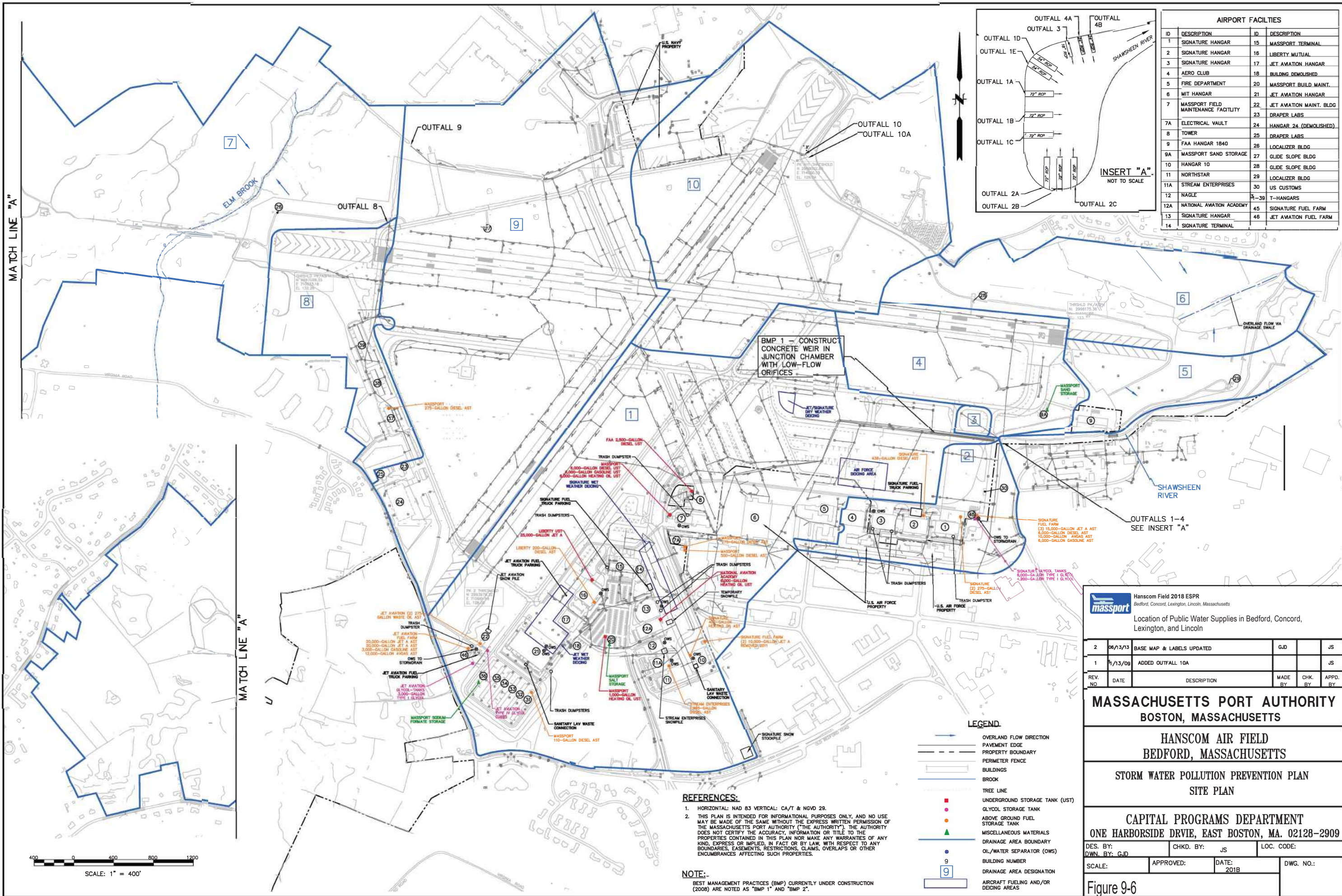
Best Management Practices (BMPs) identified in the SWPPP are divided into two sections: Baseline BMPs and Activity-specific BMPs. Baseline BMPs include general procedures to reduce stormwater pollution regardless of the type of operation at Hanscom Field. These BMPs are implemented by all tenants covered by the SWPPP. Activity-specific BMPs address particular features or operations at a facility and are applied to a tenant's specific operational situation. The two types of BMPs are identified in Table 9-8.

The Hanscom Field SWPPP also identifies the following:

- ⇒ Site drainage areas and stormwater outfall locations (shown on Figure 9-6);
- ⇒ Activities occurring at the airport and inventory of materials having the potential to affect stormwater quality;
- ⇒ Recorded significant leaks and spills;
- ⇒ Observations of dry-weather flow conditions ("non-stormwater discharges") from the storm drainage system; and
- ⇒ Descriptions of potential pollutant sources and risks; and Best Management Practices Plan.

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MATCH LINE "A"



AIRPORT FACILITIES			
ID	DESCRIPTION	ID	DESCRIPTION
1	SIGNATURE HANGAR	15	MASSPORT TERMINAL
2	SIGNATURE HANGAR	16	LIBERTY MUTUAL
3	SIGNATURE HANGAR	17	JET AVIATION HANGAR
4	AERO CLUB	18	BUILDING DEMOLISHED
5	FIRE DEPARTMENT	20	MASSPORT BUILD MAINT.
6	MIT HANGAR	21	JET AVIATION HANGAR
7	MASSPORT FIELD MAINTENANCE FACILITY	22	JET AVIATION MAINT. BLDG
7A	ELECTRICAL VAULT	23	DRAPER LABS
8	TOWER	24	HANGAR 24 (DEMOLISHED)
9	FAA HANGAR 1840	25	DRAPER LABS
9A	MASSPORT SAND STORAGE	26	LOCALIZER BLDG
10	HANGAR 10	27	GUIDE SLOPE BLDG
11	NORTHSTAR	28	GUIDE SLOPE BLDG
11A	STREAM ENTERPRISES	29	LOCALIZER BLDG
12	NAGLE	30	US CUSTOMS
12A	NATIONAL AVIATION ACADEMY	31-39	T-HANGARS
13	SIGNATURE HANGAR	45	SIGNATURE FUEL FARM
14	SIGNATURE TERMINAL	46	JET AVIATION FUEL FARM

REFERENCES:

- HORIZONTAL: NAD 83 VERTICAL: CA/T & NGVD 29.
- THIS PLAN IS INTENDED FOR INFORMATIONAL PURPOSES ONLY, AND NO USE MAY BE MADE OF THE SAME WITHOUT THE EXPRESS WRITTEN PERMISSION OF THE MASSACHUSETTS PORT AUTHORITY ("THE AUTHORITY"). THE AUTHORITY DOES NOT CERTIFY THE ACCURACY, INFORMATION OR TITLE TO THE PROPERTIES CONTAINED IN THIS PLAN NOR MAKE ANY WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, IN FACT OR BY LAW, WITH RESPECT TO ANY BOUNDARIES, EASEMENTS, RESTRICTIONS, CLAIMS, OVERLAPS OR OTHER ENCUMBRANCES AFFECTING SUCH PROPERTIES.

NOTE:

BEST MANAGEMENT PRACTICES (BMP) CURRENTLY UNDER CONSTRUCTION (2008) ARE NOTED AS "BMP 1" AND "BMP 2".

- LEGEND**
- OVERLAND FLOW DIRECTION
 - PAVEMENT EDGE
 - PROPERTY BOUNDARY
 - PERIMETER FENCE
 - BUILDINGS
 - BROOK
 - TREE LINE
 - UNDERGROUND STORAGE TANK (UST)
 - GLYCOL STORAGE TANK
 - ABOVE GROUND FUEL STORAGE TANK
 - MISCELLANEOUS MATERIALS
 - DRAINAGE AREA BOUNDARY
 - OL/WATER SEPARATOR (OWS)
 - BUILDING NUMBER
 - DRAINAGE AREA DESIGNATION
 - AIRCRAFT FUELING AND/OR DEICING AREAS

Hanscom Field 2018 ESPR
Bedford, Concord, Lexington, Lincoln, Massachusetts

Location of Public Water Supplies in Bedford, Concord, Lexington, and Lincoln

2	06/13/13	BASE MAP & LABELS UPDATED	GJD		JS
1	11/13/08	ADDED OUTFALL 10A			JS
REV. NO.	DATE	DESCRIPTION	MADE BY	CHK. BY	APPD. BY

MASSACHUSETTS PORT AUTHORITY
BOSTON, MASSACHUSETTS

HANSCOM AIR FIELD
BEDFORD, MASSACHUSETTS

STORM WATER POLLUTION PREVENTION PLAN
SITE PLAN

CAPITAL PROGRAMS DEPARTMENT
ONE HARBORSIDE DRIVE, EAST BOSTON, MA. 02128-2909

DES. BY: DWN. BY: GJD

CHKD. BY: JS

LOC. CODE:

SCALE: APPROVED: DATE: 2018

DWG. NO.:

Figure 9-6



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Table 9-8 Best Management Practices for Stormwater Protection at Hanscom Field

Baseline Best Management Practice	Activity-specific BMPs
Good Housekeeping	Emergency Spill Cleanup Plans
Preventative Maintenance	Elimination of non-stormwater discharges to storm drains
Materials Compatibility and Inventory System	Aircraft, vehicle and equipment maintenance
Spill prevention and Response Plan	Aircraft, vehicle and equipment fueling
Employee Training	Aircraft, vehicle and equipment washing
	Aircraft deicing
	Outdoor handling of material
	Outdoor material storage
	Waste handling and disposal
	Building and grounds maintenance
	Annual stormwater pollution prevention education
	Lavatory service operations
	Equipment cleaning/degreasing
	Runway maintenance
	Oil/water separators
	Maintenance of existing drainage systems
Source: Hanscom Field Stormwater Pollution Prevention Plan, January 2009 (last update 10/15).	

NPDES Visual Inspection Program

Massport has a visual inspection program, as required under the NPDES Multi-sector General Permit for Hanscom Field, for monitoring the quality of stormwater discharges. The NPDES Multi-sector General Permit for Hanscom Field does not require laboratory water quality monitoring beyond Total Suspended Solids (TSS). TSS monitoring is required for Elm Brook which is impaired water due to turbidity.

The visual inspections are conducted on a quarterly basis. The inspection procedures consist of collecting samples at stormwater outfall locations at Hanscom Field and visually inspecting the samples for color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other indications of storm water pollution. A visual assessment is performed on samples from the following outfall locations: 1, 2, 4, and 10. Because Outfalls 3, 5, 6, 9, and 10 are from similar drainage areas, only a sample from Outfall 10 is required. A data form is then completed for each observation (see SWPPP for blank data form). If contaminants are observed during the inspections, follow-up investigations are to be performed to determine the probable source of contamination. The results of such investigations are also to be recorded and

appropriate actions taken to address the situation. To date, inspections conducted at the outfalls have not identified any non-stormwater discharges.

Impaired Waters Monitoring

Elm Brook is considered a waterbody requiring a total maximum daily loads (TMDL) in Massachusetts and is listed on the "Massachusetts Year 2016 Integrated List of Waters." Annual monitoring for TSS was originally required from either Outfall 8 or 9. In April 2010, a sample was collected from Outfall 9 for impaired waters monitoring per the SWPPP. The sample was analyzed for TSS, and had a result of <5.0 micrograms per liter. Because this result was below natural background levels, further impaired waters monitoring was not required and EPA was notified that sampling was terminated at the Outfall 9 location. Elm Brook remained on the Massachusetts Year 2012 Integrated List of Waters. Based upon this designation, 2015 SWPPP for Hanscom Field identified the need to sample the water quality in Elm Brook for TSS concentrations once per year at Outfall 8.

Stormwater Mitigation

Massport requires all Hanscom Field site development, including that performed by tenants, to conform to the MassDEP Stormwater Management Standards when feasible or applicable. Improved stormwater runoff control has been achieved through the requirement that compensatory storage for stormwater be provided for any projects resulting in increases in impervious surfaces, in order to not increase peak runoff rates.

Spill Prevention Efforts

Massport has maintained a Spill Prevention Control and Countermeasures (SPCC) Plan for Hanscom Field since the 1995 Generic Environmental Impact Report. The SPCC, which was updated in 2013 is a plan outlining the steps to be taken in the event of an accidental petroleum release. Massport tenants are responsible for maintaining their own individual SPCC plans specific to their operations, as needed. The SPCC plan identifies potential discharge or spill activities that may result in a release, as well as spill prevention measures, control methods and an action plan in the event of a release. The action plan includes notification procedures, key personnel, a listing of available response equipment, tank and fuel delivery checklists, and contact numbers in case of an emergency. The SPCC includes a listing of all active oil storage tanks owned and operated by Massport as well as a general listing of other types of smaller volume (55-gallon drum) storage of petroleum-based products including motor oil, waste oil, and hydraulic fluid.

Massport maintains contracts with emergency response cleanup contractors that will respond to Massport or Massport tenant spill events at Hanscom Field. In addition, the Massport Fire Rescue Department is responsible for responding to emergency situations, including hazardous material spills, at Hanscom Field. The Fire Department maintains detailed spill reports for all reported spills at Hanscom.

The 2015 SWPPP prepared by Massport in October 2015 listed 16 fuel spills that occurred at Hanscom Field Between January 1, 2012 and November 01, 2015. All but one of these spills were caused by tenants at the airport and all but two involved the release of Jet Fuel A. The remaining two involved a release of hydraulic fluid. Of the 16 spills recorded during this time period, only four involved a reportable quantity as follows: 10 gallons of Jet Fuel A on January 9th, 2012; 200 gallons of Jet Fuel A on December 12, 2014; 30 gallons of Jet Fuel A on June 24th, 2015, and 10 gallons of hydraulic fluid released on October 30th, 2015. All spills were contained and removed in accordance with the owner/operator spill prevention control and countermeasures plan. No spills appear on the MA Executive Office of Energy and Environmental Affairs (EOEEA) Data Portal of Waste Site and Reportable Releases from 2016 to present.

The 2015 SWPPP provided revised and updated Activity-specific BMPs to address all activities at the site that could impact stormwater quality. These BMPs included an Emergency Spill Cleanup Plan.

Massport also requires annual environmental health and safety training for its employees at Hanscom Field. The training is designed to review hazardous materials used at the facilities, hazardous waste management, stormwater pollution prevention and SPCC requirements, first responder procedures and general environmental health and safety information. In addition, Massport has developed an Environmental Management Policy and has implemented an Environmental Management System (EMS) at Hanscom Field, which provides the framework for tracking, managing and improving environmental performance. As part of the EMS, spill prevention and emergency preparedness and response procedures were reviewed. A more detailed discussion of the EMS is included in Chapter 11 Sustainability and Environmental Management.

9.2.9 Environmental Audits

Beginning in the late 1980s, Massport has required environmental audits for all tenants located at Hanscom Field. The purpose of this program is to ensure that Massport's tenants are operating their businesses in compliance with applicable laws and regulations. Massport works closely with each tenant to ensure that regulatory compliance is achieved and maintained. Any issues raised during the audits are followed up with the tenant until all compliance issues have been resolved.

The tenant audits focus on hazardous waste management, water management, storage tank programs, record keeping practices, training requirements and spill response procedures. Additionally, tenants receive information on BMPs that focus on pollution prevention. Massport tenant facilities have been audited annually since 2001 and biannually for Massport operations at Hanscom Field to ensure compliance as part of Hanscom's EMS. No significant events relative to tenant noncompliance have been reported since the 2005 *ESPR*.

9.2.10 Deicing Activities

Chemical deicers (i.e., sodium formate) are periodically used on Hanscom runways or taxiways to supplement mechanical equipment such as plows and blowers to enhance safety during inclement winter weather. Sand is applied to the airfield to increase traction. Salt is applied to roadways and parking areas, and its use on the airfield is prohibited. Sodium formate has shown its effectiveness in snow and ice removal, and has been found to have significantly fewer environmental effects compared with traditional glycol-based deicers.

Aircraft deicing and anti-icing activities at Hanscom Field are currently conducted by Jet Aviation, Signature Flight Support, and Rectrix. These entities use products that are a dilute solution of propylene glycol. Most aircraft deicing is conducted near the Civil Air Terminal or the hangars.

Massport employs BMPs both as a part of its sustainability efforts to manage stormwater runoff quality at Hanscom Field, and as a component of its NPDES permit. Aircraft deicing is listed as an Activity-Specific component of Hanscom Field's Best Management Practices. Aircraft deicing is done during snow and ice events by commercial and business aircraft operators, using propylene glycol, which is included in the NPDES permit.

2003 Deicing Study

In April 2003, Massport conducted a computer modeling study of proposed airfield and existing aircraft deicing at Hanscom Field. The purpose of the study was to summarize existing aircraft deicing practices, evaluate potential airfield deicing alternatives and assess current and potential effects on receiving waters from deicing activities. Neither the EPA nor the MassDEP has identified an "unsafe" concentration of deicing fluid.

The study found that the deicing compounds that were used or were under consideration for use at Hanscom Field at the time of the study exhibited little to no human toxicity and that none was considered harmful by ingestion or has known long-term health effects. The study showed that neither current nor future scenario deicing activities at Hanscom Field would adversely affect the water supply for Bedford, Burlington or any other nearby communities.¹⁵⁰

Stormwater and In-stream Monitoring Program

Massport conducted a stormwater and in-stream monitoring program between November 2003 and March 2004 to assess any actual impacts from deicing activities and to confirm the results of the modeling study. No additional sampling has occurred since then. The sampling program consisted of seven sampling events for nine parameters. One event determined background concentrations while five events targeted stormwater and in-stream water quality during storm events when sodium formate and propylene glycol were being applied at the

¹⁵⁰ CDM, 2003. *Hanscom Field Deicing Study*, Prepared by CDM, April 15, 2003, for Massachusetts Port Authority

airport. One event quantified sodium concentrations in stormwater discharged to the Shawsheen River from road salt (sodium chloride) applications.

During each event, several rounds of samples were collected from up to ten locations (three in-stream locations, five outfall locations, one manhole location, and one culvert location). Samples were analyzed for propylene glycol concentration, sodium concentration, dissolved oxygen, chemical oxygen demand, carbonaceous biological oxygen demand, salinity, conductivity, temperature, and pH. Sodium measurements were used to calculate the sodium formate concentration in the aqueous samples. Dissolved oxygen, chemical oxygen demand and carbonaceous biological oxygen demand were used to determine the potential environmental effects of the use of the deicers on aquatic life. Salinity, conductivity, temperature and pH were used to monitor changes in the general characteristics of the stormwater and surface water bodies. Data from the monitoring program are presented in Appendix F.

The data collected during the monitoring program indicated that the concentrations of sodium formate and propylene glycol in the Shawsheen River and Elm Brook do not exceed aquatic toxicity levels. The data also demonstrated that water quality parameters, such as dissolved oxygen, are not affected by the discharge of the sodium formate and propylene glycol to the surrounding aqueous environments. The sodium concentrations measured in stormwater flow from the airfield ranged between 2.2 milligrams per liter and 92 milligrams per liter. When the highest sodium concentration of 92 milligrams per liter is converted to a sodium formate equivalent, the corresponding sodium formate concentration is 272 milligrams per liter, which is well below the established aquatic toxicity level of 1,000 milligrams per liter. Propylene glycol was found to be discharged primarily at one outfall located at the headwaters of the Shawsheen River. The in-stream propylene glycol concentrations found in the Shawsheen River ranged between not detected (with a detection limit of 2 milligrams per liter) and 270 milligrams per liter. The highest in-stream propylene glycol concentration found in the Shawsheen River, 270 milligrams per liter, is well below the reported aquatic toxicity level of 3,200 milligrams per liter. Propylene glycol was not detected in the Elm Brook sample.

Decreases in dissolved oxygen in the Shawsheen River due to propylene glycol discharge were not observed. The lowest dissolved oxygen measurement at the in-stream location of the Shawsheen River on Hanscom AFB during the study was 7.1 milligrams per liter, which is comparable to the background concentration of 7.3 milligrams per liter and above the state minimum standard of 5.0 milligrams per liter. Levels of chemical oxygen demand and carbonaceous biological oxygen demand above background concentrations at this location were observed to be directly correlated to propylene glycol discharge. The dissolved oxygen data suggests that this aquatic system is able to buffer the oxygen demand imposed by discharges of propylene glycol.

Based on the data collected during the Hanscom Field deicing study, it was determined that the concentrations of both sodium formate and propylene glycol in the Shawsheen River and Elm Brook do not exceed established levels for aquatic toxicity and do not adversely affect

other aquatic parameters (e.g. dissolved oxygen). Therefore, the use of these deicing/ anti-icing agents does not result in adverse effects on the receiving waters.

9.3 Analysis of Future Scenarios

The 2017 *ESPR* future scenarios are used to evaluate the potential cumulative environmental effects on natural resources that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3 Airport Activity Levels. The 2025 and 2035 scenarios are estimates of what could occur (not what will occur) in the future using certain planning assumptions and are not necessarily recommended outcomes. The 2025 and 2035 planning scenarios are presented in Chapter 4 Airport Planning. Massport encourages that new development be focused within areas with existing impervious surfaces that take advantage of available infrastructure and minimize impacts on habitat and water quality.

Because Massport's long-standing strategy is to maximize reuse of pre-developed areas of the airport, the 2025 and 2035 scenarios are designed to avoid impacts on vernal pools, rare or endangered species habitat, and water quality. Wherever practicable, Massport also looks for opportunities to enhance existing environmental conditions. Each of the future planning concepts that could occur over these time periods are focused on areas more than one-half mile from any of the certified vernal pools in the western portion of the airport. Several of the potential future development areas are in proximity to protected resource areas including wetlands and habitat areas. As has been Massport's policy, planning for any facilities would seek to avoid or minimize both direct and indirect adverse impacts through the design process. In the event there are unavoidable impacts, mitigation options will be considered.

Several of the facilities described in these scenarios could overlap potential habitat of the rare species of grassland birds in the infields of the airport runways or aquatic areas and adjacent uplands utilized by Blanding's and Wood Turtles. Potential indirect impacts from projects in the vicinity of these nesting areas are not expected to disrupt these populations since these species currently occupy an active airport environment. Potential water quality impacts will be avoided or minimized to the maximum extent practicable through the continued implementation and updating of the SWPPP and conformance with applicable standards for stormwater management required for site development or redevelopment by the MassDEP. Where practicable, Massport also looks for opportunities to enhance groundwater infiltration.

Some of the planning areas in the 2025 and 2035 scenarios contain wetland resources or are located near wetlands. Massport would assess every practicable effort to avoid, minimize, and mitigate potential wetland impacts for future Massport or tenant projects. Projects involving work within wetland resource areas or their buffer zones would require applications to the appropriate conservation commissions for permitting under jurisdiction of the WPA. Potential effects of the planning scenarios on wetlands, wildlife and water resources are described below.

9.3.1 Wetlands

The assessment of potential wetland impacts is a worst-case analysis assuming all the facilities described in the Planning Year Scenarios were constructed for each study year. Table 9-9 shows the facilities and the potential wetlands affected, based on the planning scenarios provided in Chapter 4.

Table 9-9 Potential Planning Concepts near Wetlands in 2025 and 2035 Scenarios

Location	Planning Concepts	Location of Potential Wetland Impacts ¹	
		2025 Scenarios	2035 Scenarios
West Ramp	<ul style="list-style-type: none"> ⇒ Upgrading or replacement of general aviation (GA) facilities with new parking spaces; new GA hangars ⇒ Salt storage facility relocation ⇒ Civil Air Terminal enhancements ⇒ New and replacement structured public parking ⇒ Expansion of the airport maintenance facility 	No delineated wetlands potentially affected; small ditch feature is shown on Figure 9-1.	Wetland 3-1 Wetland 3-2 Wetland 3-3 Wetland 3-5 Wetland 1 Wetland 2 Wetland 3 Wetland 4
Pine Hill	<ul style="list-style-type: none"> ⇒ GA facilities with new parking spaces ⇒ GA facilities on former Draper Lab site 	Wetland 1-4 buffer zone	Wetland 1-4 buffer zone Wetland 1-5
East Ramp	<ul style="list-style-type: none"> ⇒ GA facilities with new parking spaces ⇒ Alternative landside access ⇒ Expansion of GA facilities and upgrading or replacement of existing GA hangars 	Wetland 1-1 buffer zone	Wetland 1-1 buffer zone
North Airfield	<ul style="list-style-type: none"> ⇒ GA facilities with parking in area with existing parking spaces 	Wetland 2-9 buffer	Wetland 2-9 buffer
Northeast Airfield	<ul style="list-style-type: none"> ⇒ Development reserve on Parcel B site, upon reversion to Massport 	None	Wetland 1-2 potentially impacted
Note: 1. Direct impacts could occur to the wetland, unless it specifically states "buffer zone", which means potential buffer zone impacts only.			

Projects undertaken at Hanscom Field that involve work within wetland resource areas (including Riverfront Area) or buffer zones would require review and approval by the applicable conservation commission(s) through the submission of appropriate applications (NOI, Requests for Determination of Applicability, etc.) under the WPA. Approval of work within a

resource area generally requires conformance with WPA performance standards identified in Title 310 of the Code of Massachusetts Regulations, Chapter 10 (Section 54 through 58) for each resource area category, and an Order of Conditions issued by the conservation commission(s). Impacts to wetlands regulated under the Federal Clean Water Act, but not by the WPA, or impacts exceeding the area thresholds established in the WPA performance standards, could also require a Section 404 Individual Permit from the USACE, and/or Water Quality Certification from the MassDEP under Section 401 of the Federal Clean Water Act. Massport would work to refine plans to avoid or minimize potential wetlands impacts to the extent practicable.

2025 Scenario

Work may occur near wetlands in four of the five planning areas in the 2025 scenario. Work would potentially be conducted within the state 100-ft wetland buffer zone(s) at the Pine Hill, East Ramp, and North Airfield planning areas. At the West Ramp planning area, no delineated wetlands are near the site, however, a small ditch feature is located within the planning area that should be investigated prior to future activities at this site. No activities are proposed at the Northeast Airfield planning area.

2035 Scenario

For the 2035 scenario, all of the planning areas could have potential impacts to wetland areas, either direct, or to the wetland's buffer zone. In the Northeast Airfield Area, the 2035 scenario shows potential work areas directly within Wetland 1-2. Wetland 1-5 may potentially be directly impacted under the 2035 scenario for the Pine Hill planning area. Work would potentially be conducted within the 100-foot wetland buffer zone(s) at the Pine Hill, East Ramp, West Ramp, and North Airfield planning areas. In all cases, efforts would be made to avoid impacts where possible.

9.3.2 Vernal Pools

Any future projects proposed within or adjacent to the certified vernal pools would need to be reviewed by the NHESP through the submission of a copy of a Notice of Intent (NOI) prepared under the WPA. None of the proposed projects proposed for either the 2025 or 2035 scenarios would be located near the three vernal pools and therefore no impacts are expected to occur.

The certified vernal pools are located near the end of Runway 11 where vegetation management operations may occur. As with the current VMP, which details vegetation management at Hanscom Field, future vegetation removal projects developed for the period from 2018 through 2020 will be based on the VMP and will incorporate plans to protect vernal pools. Also, Massport is in the process of preparing the 2019-2023 VMP update, which may recommend additional vegetation management work. These future projects, which are within the guidelines established in the VMP, would also undergo review by the appropriate conservation commissions and the NHESP. A plan to protect the certified vernal pools during

vegetation management operations has been incorporated in the Hanscom Field VMP, which was approved by the four conservation commissions.

During wetland delineations in 2012, it was noted that Wetland Nos. 2 and 3 may have characteristics of vernal pools. In the event any future work is considered in these areas, additional evaluation of these potential resource areas would be warranted.

2025 Scenario

No impacts to three certified vernal pools near the western end of Runway 11/29, or their wildlife habitat value, would result from the potential locations for new facilities in the 2025 scenario. The potential location of a facility nearest to the vernal pools would be the Pine Hill Area, situated approximately 3,100 feet to the southeast.

2035 Scenario

No impacts to vernal pools would occur from development in the 2035 scenario. Development areas are approximately the same as the 2025 scenario, and therefore risk of impact is the also very similar.

9.3.3 Rare and Endangered Species

Four of the five potential action areas considered under the 2025 or 2035 scenarios include areas of critical habitat of rare and endangered species. As noted in the Rare and Endangered Species section above, two rare species of grassland birds have been observed at Hanscom Field: upland sandpiper (endangered) and grasshopper sparrow (threatened). Each of these species nests within runway infield areas that are periodically mowed to maintain grassland vegetation for safe aircraft operation. Any work within critical grassland habitat areas would need to be reviewed by the NHESP before commencement of activities.

In addition, two turtle species have more recently been identified. These reptiles inhabit aquatic areas and the adjacent uplands. Any project proposed in the buffer zone of a wetland or in the Riverfront Area associated with a perennial stream must file a NOI with the conservation commission. Should any work be proposed in areas previously utilized by Blanding's or Wood Turtles, the project would also need to be reviewed by the NHESP. The future development scenarios do not include work near these brooks and streams.

Since the 2012 report, the Northern Long-eared Bat has been listed under the Federal ESA. As discussed in Section 9.2.5.1, the Massachusetts Natural Heritage and Endangered Species Program maintains records for municipalities in the Commonwealth for known hibernacula and roost trees; there are no Massachusetts NHESP records of known maternity roost trees or hibernacula within the project area or the surrounding area. Any proposed activity within wooded areas should be conducted in accordance with BMPs provided by the USFWS to ensure no impacts to this species. Since four of the five potential planning areas will have some level of tree removal, measures will need to be taken to ensure this species is not impacted.

2025 Scenario

The 2025 scenarios for the Pine Hill and North Airfield planning areas would overlap small areas of critical grassland habitat along the edge of the airport; much of this planning unit is currently developed. Small areas of suitable grassland habitat for Grasshopper Sparrows may be impacted, however, the loss of these areas would be small relative to the overall habitat on the airport. Impacts to these areas would be avoided and minimized to the extent practicable, but would also need to be reviewed by the NHESP. Where possible, Massport would look to offset any grassland losses through removal of excess airfield pavement.

Protected turtle species are located in brooks and streams and occur in adjacent uplands. These species are primarily associated with Elm Brook and the Shawsheen River on Hanscom which occur on the western and northern part of the airport and flow north. No work in the 2025 scenario is proposed across or adjacent to either of these waterways. The closest planning area to Elm Brook is North Airfield, which is approximately 1,000 feet at its closest point; the Pine Hill planning area is approximately 1,600 feet from Elm Brook at its closest point. The closest planning area to the Shawsheen River is the East Ramp, which is approximately 3,300 feet at its closest point.

Under the 2025 scenario, the West Ramp area may have minor tree clearing, while the North Airfield planning area shows a large tree removal area. As discussed above, removal of these trees should be coordinated with the NHESP and USFWS to ensure no impacts to the NLEB and that proper BMPs are undertaken, to ensure no impacts to this species.

2035 Scenario

The 2035 scenarios for Pine Hill and East Ramp planning areas also overlap small areas of critical grassland habitat along the edge of the airport. The 2035 Northeast Airfield planning area is shown to impact a larger area of critical grassland habitat, part of which is also within a vegetation management area. Impacts to these areas would be avoided and minimized to the extent practicable, but would also need to be reviewed by the NHESP.

No impacts to the Blanding's or Wood turtles are anticipated under this scenario. No work in the 2035 scenario is proposed across or adjacent to either of these waterways. Similar to the 2025 scenario, the activities under the 2035 scenario are far from the Shawsheen River and Elm Brook and would have no impact on these species' habitats.

Under the 2035 scenario, the Pine Hill area may have minor tree clearing, the North Airfield area has moderate tree clearing, and the Northeast Airfield and West Ramp planning areas show larger tree removal areas. As with the 2025 scenario, removal of these trees should be coordinated with the NHESP and USFWS to ensure no impacts to the NLEB and that proper BMPs are undertaken, to ensure no impacts to this species.

9.3.4 Water Quality

Since all components under the 2025 or 2035 scenarios would be required to meet requirements of the NPDES Permit and applicable MassDEP standards for stormwater management, the potential for water quality impacts under the planning year scenarios are expected to be similar to each other. In addition, many of the developments contemplated in the Master Planning areas would occur in areas of existing impervious development and would minimize water quality and quantity impacts. Some areas of potential development would occur in areas of pervious grassland or woodland. Massport would ensure any development meets their standard of zero increase of post-development discharge through appropriate measures to store and treat stormwater. Also, Massport typically tries to offset any impervious surface increases by removal of excess pavement on other portions of the airfield.

2025 Scenario

Massport will continue to follow, and require tenants at Hanscom Field to follow, the development and facility operational requirements under the then-current NPDES Permit. All potential new facilities in the 2025 scenarios would also be required to meet applicable MassDEP standards for stormwater management, when feasible. Therefore, the 2025 scenario is not anticipated to result in any impacts to water quality, and the continued Best Management Practice efforts would be expected to result in improvements to water quality over time. Stormwater management would be integrated into all future development to ensure compliance. Ongoing groundwater remediation efforts noted in the Groundwater Conditions and Water Quality portion of this chapter would also be expected to improve water quality on and off site. In addition, many of the planning areas located in existing impervious areas, with a total projected increase of 8.7 acres over the 2012 base condition. Massport would review areas where existing pavement can be removed to achieve no net increase in impervious surface if these projects are to move forward.

The potential North Airfield and Pine Hill areas are located in the Zone II Wellhead Protection Area for the Bedford wells. Massport would work with potential developers of these sites to ensure that any potential facilities are designed to protect the recharge area of the Bedford public wells. These measures, as well as elements of Massport's spill prevention program, are designed to protect the recharge area of the Bedford public wells.

2035 Scenario

Conditions for the 2035 scenario would be similar to those described for 2025. Larger potential areas of impervious surface would be created at the West Ramp and Northeast Airfield planning areas, due to possible development of grassland and woodland areas. In addition, many of the planning areas located in existing impervious areas, with a total projected increase of 64.7 acres over the 2012 base condition. There are large increases in impervious surface for the Northeast Airfield in the 2035 scenario. Since this area is reserved for future aviation strategic development, there are no specific development plans at this time, but it is

nonetheless included in this evaluation. The West Ramp also shows a large increase in 2035 due to the areas on either side of the terminal area access roadway which are also reserved for future aviation strategic development. Massport would review areas where existing pavement can be removed to achieve no net increase in impervious surface if these projects are to move forward.

10

Cultural & Historical Resources



This chapter provides information about existing cultural and historical resources at Hanscom Field and in areas adjacent to Hanscom Field. The documentation of historical and archaeological resources in the area includes resources currently listed in both State and National Registers of Historic Places, the Inventory of the Historic and Archaeological Assets of the Commonwealth (Inventory), and the Massachusetts Cultural Resource Information System (MACRIS).

The Massachusetts Historical Commission (MHC) maintains these sources. The 2005 ESPR and update in the 2012 ESPR provided the

foundation for the update presented in this 2017 ESPR. The current analysis entailed research, field data collection, and discussions with the historical commissions for each of the four towns and the incorporation of any information they provided.

The inventory update of existing cultural and historical resources also included a review of the status of historic buildings and landscapes in Minute Man National Historical Park (MMNHP).

10.1 Key Findings Since 2012

Incorporating input from the four host towns and Minute Man National Historical Park (MMNHP) into the results of research in state files and field review, there have been just a few additions to the cultural and historic resources inventory for the area in and around Hanscom Field since 2012. The analysis of potential impacts on cultural and historical resources demonstrates that no residential land uses, including historic resources, were exposed to a Day-Night Average Sound Level (DNL) value above the Federal Aviation Administration (FAA) land use compatibility recommendation of DNL 65 dB in 2017. Both total operations and noise levels remain well below historical peaks. Hanscom Field continues to follow operational measures that have been implemented to limit noise including the Fly Friendly Program in place since 2009.

The 2017 *ESPR* updates the 2012 *ESPR* conditions for comprehensive reconnaissance surveys of historic and archaeological resources that are listed in or eligible for the National and State Registers, in the state inventory and the Massachusetts Cultural Resource Information System (MACRIS), or are 50 years or older. The 2017 survey update includes a few additional resources within the four Hanscom towns.¹⁵¹ There have been no changes to the historic resources within the boundaries of MMNHP.

In 2015, Massport initiated the design and fabrication of an interpretive display and brochure in accordance with the Memorandum of Agreement (MOA) among the FAA, the Massachusetts State Historic Preservation Officer, and Massport regarding the replacement of Hangar 24 at Hanscom Field. To seek public comment, Massport issued a draft copy of the Hangar 24 Interpretive Display ("the display") on the week of August 8, 2016. No comments were received. On March 17, 2017, Massport completed and installed the display

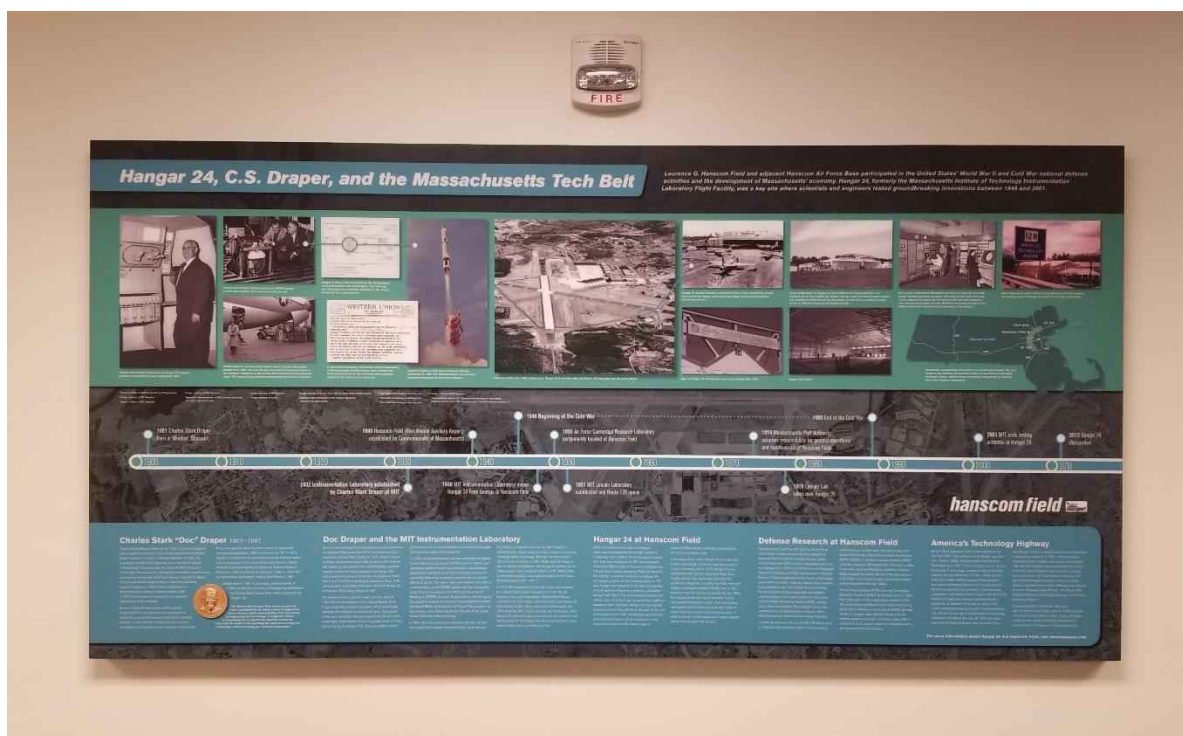
Key findings from the comprehensive reconnaissance survey updates:

- ⇒ No historic resources are exposed to noise of DNL 65 dB in 2017.
- ⇒ No changes to historic resources within the MMNHP; one survey area and two local landmark new properties have been added to the four towns surrounding Hanscom Field.
- ⇒ The 2035 forecast scenario shows fewer cultural and historic resources within the DNL 55 dB noise contour than was forecast for 2030 in the 2012 *ESPR*.
- ⇒ Impacts to cultural and historic resources from traffic and air quality have decreased since 2012.

¹⁵¹ The 2017 survey update consists of two reports: Adams et al. (PAL) Historic Resources Reconnaissance Survey Update, for Hanscom Field 2017 Environmental Status & Planning Report, Bedford, Concord, Lexington, and Lincoln, Massachusetts, 2018; and Banister and Herbster (PAL), Archaeological Reconnaissance Survey Update, for Hanscom Field 2017 Environmental Status & Planning Report, Bedford, Concord, Lincoln, and Lexington, Massachusetts, 2018. These two reports update information compiled in comprehensive surveys completed for the 2005 *ESPR* and updates prepared for the 2012 *ESPR*, which are referenced in the relevant sections below.

and published notification of its completion in each of the surrounding town newspapers on the week of December 18, 2017. The display may be viewed daily on the first floor of the Civil Air Terminal Building, 200 Hanscom Drive and an image of the display is published on the Massport website.¹⁵² The accompanying interpretive display brochures are located at the following locations: Bedford Library, Bedford Town Clerk, Bedford Town Manager's Office, Concord Library, Concord Visitors Center, Concord Town Hall, Lexington Library, Lexington Visitors Center, Lexington Service Plaza, Lincoln Library, Lincoln Town Hall, and Hanscom AFB Education and Training Center.

Figure 10-1 Hangar 24 Interpretive Display at Hanscom Field Civil Air Terminal



As in the 2012 *ESPR*, the 2017 *ESPR* provides a new noise analysis for historic resources. It is a conservative analysis that incorporates the largest area potentially affected based on the maximum forecasted noise values, as presented in Chapter 7 Noise. In 2017, this is the area contained within the 2035 planning year 55 DNL noise contour line (depicted in Figure 7-18). The 2012 *ESPR* similarly presented information about resources in the forecasted 2030 scenario. The projected 2035 noise contour in the 2017 *ESPR* generally covers a smaller area than the forecasted 2030 high growth noise contour in the 2012 *ESPR*, except at the east end where the noise contour extends slightly further east in the 2035 forecast. The numbers of historic properties within this contour are reduced in several locations, and increased at the

¹⁵² <http://www.massport.com/massport/about-massport/project-environmental-filings/hanscom-field/>

east end where the contour is longer. A reconnaissance area surveyed in the 2005 and 2012 *ESPRs*, was added to the state historic inventory since 2012.

The 2017 *ESPR* also provides an analysis of historic and archaeological properties encompassed within a 200-foot radius of 10 Traffic Study Areas (TSAs) at various road intersections outside of the Hanscom Field boundary. The TSAs are described in Chapter 6 Ground Transportation. The historic and archaeological properties present at the TSAs are the same for the 2012 *ESPR* and the 2017 *ESPR*. The 2017 *ESPR* describes the environmental effects of traffic and air quality, as discussed in Chapter 6 and in Chapter 8 Air Quality, on cultural and historic resources. The findings show that the environmental effects of traffic and air quality on cultural and historic resources have decreased between 2012 and 2017.

10.1.1 Overview of Survey Areas and Updates

Historic Resources Overview

The 2017 historic resources survey updated information on National and State Register historic properties in the 6,000-acre, roughly 3 by 4-mile, *ESPR* General Study Area within and around Hanscom Field.¹⁵³ The General Study Area is defined as an area of approximately 45 square miles that is depicted in Figure 10-2, in which a file review and field verification update of National and State Register properties was completed to provide a broad understanding of the historic resources in the vicinity of Hanscom Field. The General Study Area remains consistent between the *ESPRs*. The historic resources survey for the Reconnaissance Study Area also updated information on resources included in the MHC's statewide Inventory and MACRS. The Reconnaissance Survey Area, superimposed within the General Study Area, can vary as it is comprised of the area within the future 55 DNL noise contour and a 200-foot radius around the Traffic Study Areas (TSAs). It includes all of Hanscom Field, part of Hanscom AFB, part of MMNHP, and parts of Bedford, Concord, Lexington, and Lincoln. The 2017 *ESPR* historic resources survey updated information gathered for two previous *ESPRs* to reflect current conditions.¹⁵⁴

This survey in the General Study Area showed that currently there are a total of 65 historic properties (i.e., 41 individual properties and 24 districts [with the MMNHP counted as one district]) included in, or determined eligible for the National and State Registers. These properties include 13 National Historic Landmarks (NHL), with the MMNHP counting as one NHL. The 2017 *ESPR* totals represent a small increase by 2 for both individual properties and districts, and an increase of 1 NHL, from the 2012 *ESPR* (additional details are in Section 10.4.1).

¹⁵³ The General Study Area consists of the portions of the towns of Bedford, Concord, Lexington, and Lincoln that are shown as a rectangular area in the map figures in this chapter.

¹⁵⁴ Adams et al. (PAL) Historic Resources Reconnaissance Survey Update, for Hanscom Field 2017 Environmental Status & Planning Report, Bedford, Concord, Lexington, and Lincoln, Massachusetts, 2018. Adams et al. (PAL) Historic Resources Reconnaissance Survey Update, for Hanscom Field 2012 Environmental Status & Planning Report, Bedford, Concord, Lexington, and Lincoln, Massachusetts, 2013. Adams et al. (PAL) Historic Resources Reconnaissance Survey, for Hanscom Field 2005 Environmental Status & Planning Report, Bedford, Concord, Lexington, and Lincoln, Massachusetts, 2006.

The properties range from individual houses to large historic districts with structures and associated landscape settings. The analyses included properties on Hanscom Field and Hanscom AFB. The National Park Service (NPS) has identified approximately 106 historic resources that contribute to the historical significance of MMNHP.

In addition to updating information on the historic properties listed in or eligible for the National and State Registers, the *2017 ESPR* also updates the survey of historic resources within a Reconnaissance Survey Area defined as maximum forecasted noise value for the *ESPR* within the 2035 55 DNL noise contour (including Hanscom Field) and a 200-foot radius around each of 10 TSAs (see Figure 7-18). The survey update for this area also encompassed historic resources in the Massachusetts Historical Commission's (MHC) Inventory and MACRIS, and provided an update of the preliminary identification of resources that are 50 years old or older that have not been previously surveyed on Hanscom Field and in the four towns. The 2017 survey update for the Reconnaissance Survey Area inside the forecasted 2035 55 DNL noise contour line showed no change since 2012 (see Figure 10-9). There continue to be three individual historic properties (Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace), 341 Virginia Road in Concord; Wheeler-Meriam House, 477 Virginia Road in Concord; and Simonds Tavern, 331 Bedford Street in Lexington) and a small section of one historic district/NHL, MMNHP, that are listed in or eligible for inclusion in the National and State Registers. Noise analysis was completed for these National and State Register properties.

The 2017 update of the Reconnaissance Survey Area in the 2035 55 DNL noise contour also identified all or portions of 10 survey areas and 175 individual resources that are in the MHC Inventory and MACRIS. This information is included in Appendix G. It also includes within the noise contour potential reconnaissance historic resources as parts of 3 survey areas and 2 individual properties. This is compared with 8 areas/historic districts and 58 individual properties in MACRIS in 2012, and 20 districts and 32 individual properties in 2005. The increases by 1 or 2 resources are attributed to new historic resources being added to the inventory over the five year period. The larger increase from 58 individual resources in 2012 to 175 in 2017 is due to the addition of one survey area in Lexington (Lexington Manor Area) and also to the availability of more precise GIS- and parcel-based mapping.

The 2017 survey update within the Reconnaissance Survey Area at the 10 TSA intersections identified no historic resources at three of the TSAs. Seven of the TSAs fall within the boundaries of the MMNHP. Inventoried historic resources also are present, outside of the MMNHP boundaries, at three TSAs. As in the survey for the *2012 ESPR*, the 2017 survey update verified that all historic resources within the 10 TSAs were already included in the MHC Inventory and MACRIS and/or the State and National Registers. No previously undocumented historic resources were identified at any of the 10 TSAs.

The survey in the General Study Area of properties that are 50 years or older completed for the *2012 ESPR* identified 359 individual properties and 51 areas in the Inventory and MACRIS, and an additional 336 individual properties and 11 locations within that survey area that had not been previously documented. One of these undocumented areas (East of Bedford Street) in

Lexington has been added to the Inventory and MACRIS as a survey area (Lexington Manor Area) since 2012.

Archaeological Resources Overview

For archaeological resources, the survey update for the *2017 ESPR* updated information gathered for two previous ESPRs to reflect current conditions.¹⁵⁵ It included a review of National and State Register files, MHC inventory and site files, and the online database MACRIS to update information on recorded archeological sites within Hanscom Field and near the 10 TSAs. The review completed for *2012 ESPR* identified one recorded site outside Massport property near the intersection of Hanscom Drive and Old Bedford Road. An additional previously recorded 39 sites that have not been evaluated for eligibility for listing in the National and State Registers were identified in Bedford, Concord, Lexington, and Lincoln. This included six sites completely or partially within the property line of Hanscom Field. A 2005 archaeological overview and assessment of MMNHP for NPS reported that there were more than 100 prehistoric and historic period archaeological sites identified within the Park.¹⁵⁶

The analysis completed for the *2017 ESPR* found little change in the status of archaeological information since the reconnaissance survey conducted for the *2012 ESPR*. The prior reconnaissance archaeological survey found that most of Hanscom Field has been previously disturbed by construction. Areas of high pre-contact archaeological sensitivity include previously undisturbed, dry, level areas located adjacent to the natural brooks and wetlands in the peripheral portions of Hanscom Field. The extreme southern section of Hanscom Field and the intersections along Route 2A have moderate to high archaeological sensitivity for post-contact resources associated with the April 19, 1775 engagement along Battle Road, now part of the MMNHP. The update for the *2017 ESPR* determined that existing conditions within the Hanscom area have remained largely unchanged since the *2012 ESPR* and that no new archaeological sites have been identified within study area.

Noise Analysis Overview

The *2017 ESPR* updates the noise analyses for historic properties forecasted to have maximum noise exposure. Chapter 7 Noise, reports noise levels at Hanscom Field in terms of DNL contours for 55, 60, 65 and 70 DNL exposure. DNL is a noise metric that refers to Day-Night Sound Level for typical 24-hour exposure periods. Further detail on DNL analysis is presented in Chapter 7, and an explanation of noise terminology is in Section 7.2. No residential land uses

¹⁵⁵ Banister and Herbster (PAL), Archaeological Reconnaissance Survey Update, for Hanscom Field 2017 Environmental Status & Planning Report, Bedford, Concord, Lincoln, and Lexington, Massachusetts, 2018. Banister and Herbster (PAL), Archaeological Reconnaissance Survey Update, for Hanscom Field 2012 Environmental Status & Planning Report, Bedford, Concord, Lincoln, and Lexington, Massachusetts, 2013. Banister and Herbster (PAL), Archaeological Reconnaissance Survey, for Hanscom Field 2005 Environmental Status & Planning Report, Bedford, Concord, Lincoln, and Lexington, Massachusetts, 2006.

¹⁵⁶ Herbster (PAL), Archaeological Overview and Assessment, Minute Man National Historical Park, Concord, Lincoln, and Lexington, Massachusetts, 2005.

were exposed to a DNL value above the FAA land use compatibility recommendation of 65 dB in 2017. Table 10-1 summarizes noise exposure on National and State Register properties and the MMNHP by identifying those resources within the 65 DNL and 55 DNL contours. Of these resources, consistent with the 2012 findings, no part of the Hartwell Town Forest/Jordan Conservation Area, which is included in MACRIS, is within the 65 DNL contour; this compares to 1.4 acres in 2005. Locations within the 55 DNL contour align with runway ends and air traffic patterns to the south and west or within close proximity to Hanscom Field (e.g., historic sites on Virginia Road). Massport and the NPS continue to cooperate on the implementation of the Fly Friendly program instituted in 2009 with a noise abatement program and voluntary measures to minimize noise impacts on the MMNHP and residential areas.

The DNL values at National and State Registers historic properties in 2017 experienced changes ranging from a decrease of 0.6 dB to an increase of 4.0 dB relative to 2012 (see Table 7-26, Table 7-27, Table 7-28 and Table 7-29). Changes in DNL in the 2025 and 2035 scenarios for the 2017 *ESPR* are projected to range from a decrease of 1.1 dB to an increase of 1.4 dB relative to 2017 levels.

Traffic and Ground Transportation Impacts Overview

As discussed in Chapter 6 Ground Transportation, in 2018¹⁵⁷, Hanscom Field represented approximately 2 percent of peak hour traffic on Route 2A, which is a reduction from 2012. The traffic level on Route 2A attributed to Hanscom Field in the 2012 *ESPR* was between three and four percent. For both the 2025 and 2035 scenarios, Hanscom Field-related traffic on Route 2A is expected to remain steady at approximately two percent of peak hour traffic.

In addition, there has been a reduction in traffic volumes on Hanscom drive of between four and five percent for morning and afternoon peak hours between 2012 and 2018.

In 2012 and in 2018, Hanscom Field traffic exceeded the ten percent MEPA threshold at only one intersection on Route 2A in the MMNHP: #6) Hanscom Drive/Route 2A in Lincoln. Hanscom Field traffic exceeds ten percent of a single traffic movement at one Route 2A intersection (Hanscom Drive/Route 2A) in the 2025 and 2035 scenarios.

Massport supports Transportation Demand Management (TDM) strategies to reduce its contribution to traffic on area roadways, as well as potential traffic management strategies that do not require physical modification to intersections. No physical modifications are currently proposed by Massport to the three (of 10 studied) TSA intersections that meet the threshold for analysis in the *ESPR*, and, therefore, there are no adverse effects to the identified historic and archeological resources in 2018 for the 2025 and 2035 forecast scenarios.

¹⁵⁷ As described in Chapter 6 Ground Transportation, data collection for the traffic analysis occurred in April of 2018. Therefore 2018 is referenced when discussing current conditions for traffic as opposed to 2017 for other categories of current conditions.

Air Quality Impacts Overview

As described in Chapter 8, there are no adverse effects attributable to air quality in 2017 or the 2025 and 2035 scenarios. Air quality in the region currently meets federal and state ambient air quality standards as established by the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP), and is forecasted to remain well below the regulatory thresholds in the future years 2025 and 2035. Therefore, this analysis concluded that no adverse air quality effects to historic resources, including MMNHP, are anticipated now or in future analysis years from activities at Hanscom Field.

10.2 2017 Conditions

This section presents conditions in 2017 for cultural and historic resources within Hanscom Field and in the General Survey Area and Reconnaissance Survey Area illustrated in Figure 10-2. The noise analysis location labels in this figure refer to information presented in Chapter 7 and in Table 10-2, Table 10-3, Table 10-4, and Table 10-5 for the four host towns and in Table 10-13 for MMNHP. The description of 2017 resources focuses first on the survey update for historic resources, then archaeological resources, and concludes with MMNHP. Current conditions in each group are followed by analyses of current and projected noise, traffic and traffic study area intersections (TSAs), and air quality. The noise analysis evaluates the 65 DNL noise contour and the 55 DNL noise contour. The 65 DNL noise contour was used as a guideline for determining potential land use incompatibilities, in accordance with FAA guidelines. The EEA Scoping Certificate for the 2017 *ESPR* identified the 55 DNL noise contour for inclusion in the noise analysis.

Historic and archaeological resources were identified for areas within 200 feet of the 10 traffic study area intersections to provide baseline data to assess potential traffic effects on these resources. Traffic concerns are related to overall traffic volumes on roadways, particularly Route 2A through the MMNHP, and the operation of intersections. Although Hanscom Field traffic made up only 2 percent of the traffic on Route 2A during the morning peak hour and afternoon peak hours in 2018, Massport will continue to assess traffic management approaches that do not involve physical changes to intersections, if potential improvements are warranted to address identified needs. Appendix G summarizes historic resources near the 10 intersections.

Table 10-1 Summary of Noise Effects on Cultural and Historic Properties

Resource ¹	Total Quantity ²	2012	2017	2025	2035
Properties/Geographic Areas within 65 DNL Contour³					
National and State Registers Individual Properties ⁴	41 properties	0 properties	0 properties	0 properties	0 properties
National and State Register Historic Districts ⁵	1,646 acres	0 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975 acres	0 acres	0 acres	0 acres	0 acres
Battle Road Interpretive Trail	4 miles	0 miles	0 miles	0 miles	0 miles
Properties/Geographic Areas within 55 DNL Contour³					
National and State Register Individual Properties ⁴	41 properties	3 properties	3 properties	3 properties	3 properties
National and State Register Historic District ⁵	1,646 acres	0 acres	0 acres	0 acres	0 acres
Minute Man National Historical Park	975 acres	0 acres	55 acres	30 acres	26 acres
Battle Road Interpretive Trail	4 miles	0 miles	0 miles	0 miles	0 miles
Notes:					
1. See Tables 10-2 through 10-5 for more detail on National and State Registers individual properties and historic districts.					
2. All surveyed historic properties; total acreage of surveyed historic districts, MMNHP.					
3. This is the exposure level that the FAA identifies as a guideline for determining potential land use incompatibilities.					
4. In General Study Area. Does not include MMNHP sites. In this tale, the noise effects are quantified through the estimation of park acreage within a given contour.					
5. In General Study Area. Includes Bedford Depot Park Historic Dist., Bedford Historic Dist., and Old Bedford Center Historic Dist., Hubbard-French Historic Dist., Hubbardville Historic Dist., East Village Historic Dist., Hancock-Clarke Historic Dist., Lexington Green Historic Dist., and Munroe Tavern Historic Dist. In Lexington; and Lincoln Historic Dist. In Lincoln. Areas of overlap in districts are counted once.					

10.3 Identification and Designation Process

Information on historic and archaeological resources in the 2017 *ESPR* is based on updated identification data collected in a series of planning steps. Data collection consisted of reviewing the 2012 *ESPR* reconnaissance survey , updating baseline research, and conducting a drive over/walkover field survey to verify the current conditions. This process resulted in an updated reconnaissance-level preliminary list of known resources and sensitive areas. The majority of the resources identified in the data collection are previously recorded, including historic resources currently included in the MACRIS on-line database, resources listed in the National

and State Registers of Historic Places (National and State Registers); and resources designated as National Historic Landmarks (NHLs).

The collected information is appropriate for the planning purposes of the *2017 ESPR*, but is not finite. In the future, as additional historic resources reach 50 years of age, the towns, state or federal agencies may conduct intensive-level surveys for general or specific planning purposes. These surveys would include examination of the history, context, and physical characteristics of all or selected unrecorded historic resources in more detail. The results would involve

completion of Massachusetts Historical Commission (MHC) Inventory forms, entry in the Inventory of the Historic and Archaeological Assets of the Commonwealth and inclusion in the MACRIS, and evaluation of eligibility for listing in the National and State Registers. Listing or eligibility for listing in the National and State Registers is a threshold factor for environmental review of historic and archaeological resources during project planning.

The State Register of Historic Places (State Register), maintained by the MHC, is an umbrella compilation of historic properties and districts that have been designated as historically significant in one or more different programs at the local, state, and national level.

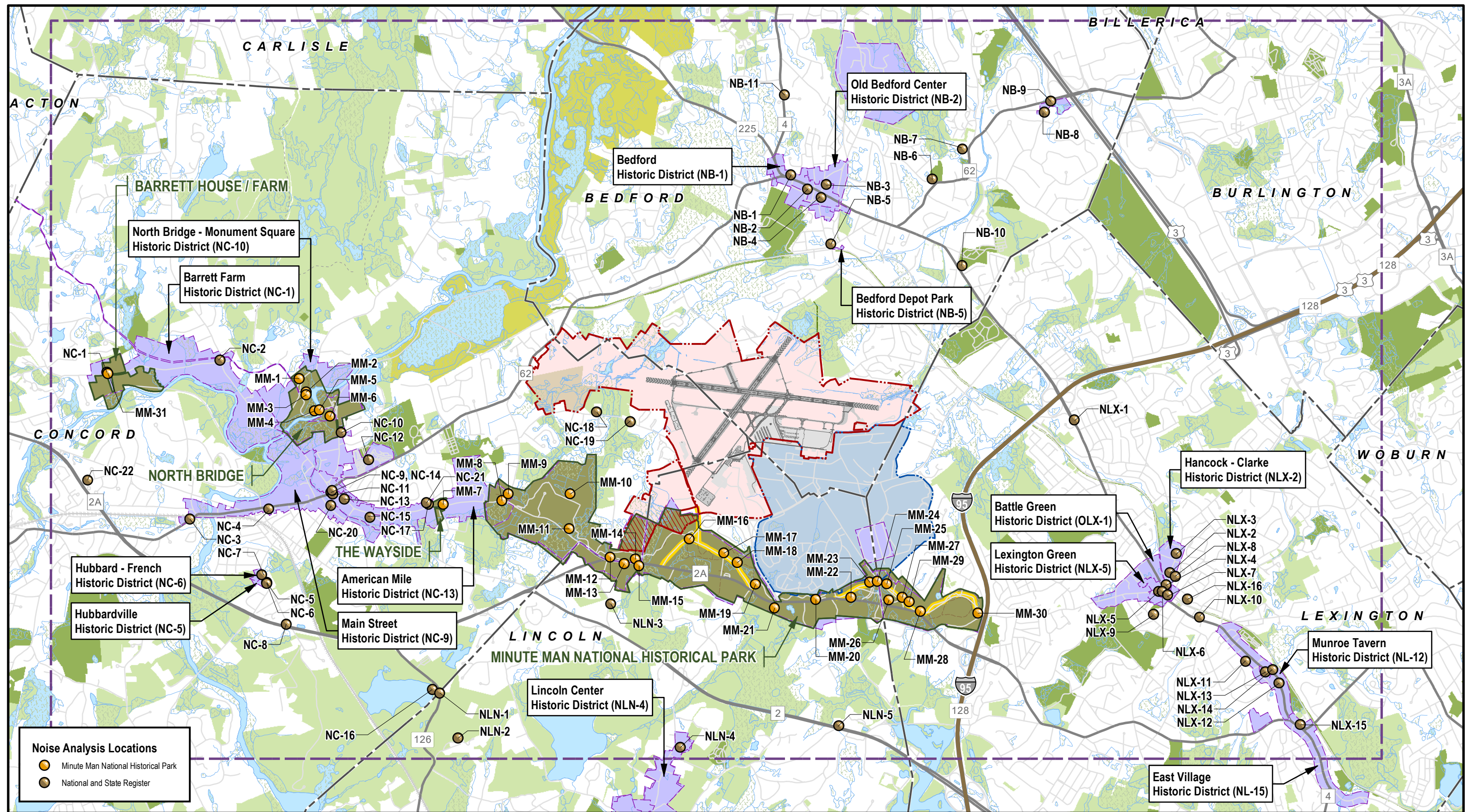
The State Register consists of inventoried historical resources that have been evaluated and formally designated as historically significant due to meeting the criteria for listing in one of the following categories:

- ⇒ NHLs designated by the U.S. Congress;
- ⇒ Resources listed or formally determined eligible for inclusion in the National Register;
- ⇒ Massachusetts Archaeological or Historic Landmark designated by MHC;
- ⇒ Local Landmark or Local Historic District determined by a community;
- ⇒ Regional Historic District established by State legislature; and
- ⇒ Resources subject to a Preservation Restriction managed by the MHC.

The MHC updates the State Register regularly, and the current edition was consulted for information included in the *2017 ESPR*. Section 10.4 presents information from the National and State Registers.

The National Register is the nation's official list of historic properties deemed worthy of protection by the NPS. To be eligible, resources must:

- ⇒ Meet criteria established by the NPS;
- ⇒ Possess historic integrity;
- ⇒ Be significant in local, state or national history; and
- ⇒ Properties are nominated by the MHC.



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018



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Historic Resources Included as Noise Analysis Locations

Figure 10-2



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10.4 Historic Resources

This section updates the status of historic resources within two overlapped areas. Research and field survey for a reconnaissance survey update for inclusion in the 2017 *ESPR* was completed for National and State Register properties, resources included in the MHC's Inventory and MACRIS, and unrecorded resources that are 50 years old but have not been inventoried. Data collection methodologies included review of documents, reports, agency files and databases, archival materials, and historic maps. Interviews and information sharing meetings were conducted with National Park Service representatives from MMNHP, and the local historical commissions of Bedford, Concord, Lexington, and Lincoln. Available planning studies conducted within or adjacent to Hanscom Field were also consulted. The results informed the list of noise analysis receptors and locations that were the basis of the 2017 *ESPR* Chapter 7 noise analysis.¹⁵⁸

The following historic properties are located in each town:

- ⇒ Bedford contains five historic districts and seven individual properties.
- ⇒ Concord contains eight historic districts (including a portion of the MMNHP, an NHL) and 19 individual properties, including eight individual NHLs.
- ⇒ Lexington contains 10 historic districts (including a portion of the MMNHP, an NHL) and seven individual properties, including one district and three individual NHLs. The Richard Gleason Tower Estate local historic district was added in 2017.
- ⇒ Lincoln contains two historic districts (including a portion of the MMNHP, an NHL) and five individual properties, including one individual NHL.

10.4.1 National and State Registers Properties

The existing conditions for National and State Registers-listed historic properties were assessed for the area shown in Figure 10-2. As noted above in Section 10.1, the survey for the 2012 *ESPR* identified a total of 61 historic properties, or 39 historic buildings and 22 districts (with the MMNHP counted as one district) included or eligible for inclusion in the National and State Registers. Based on the investigations for the 2017 *ESPR*, a total of 65 historic resources, or 41 individual historic properties and 24 districts (with the MMNHP counted as one district), are currently included in, or determined eligible for inclusion in, the National and State Registers within the General Study Area. These resources include 13 National Historic Landmarks, with MMNHP counted as one NHL, and are listed in Table 10-2, Table 10-3, Table 10-4, Table 10-5 and shown in Figure 10-2. The resources listed in or eligible for the National and State Registers range from individual houses to large historic districts with structures and associated

¹⁵⁸ Adams et al. 2006, 2013, 2018. See footnotes 1 and 4.

landscape settings, and are distributed as follows in the four towns. There has been one additional historic property added, a State Register property in Lexington, since the *2012 ESPR*.¹⁵⁹

The largest single historic resource is MMNHP, an NHL district with four separate units in Concord, Lexington, and Lincoln that contains numerous historic buildings and places, including individual NHLs. MMNHP and its historic resources are discussed in Section 10.6.

10.4.2 Existing Noise Conditions for National and State Registers Properties

All 41 individual properties and 24 historic districts (including MMNHP) listed in the National and State Registers were evaluated in Chapter 7. The relationship of these properties to 2012 and 2017 noise levels is shown in Figure 10-3. None of the individual properties or historic districts is within the 65 DNL contour in 2012 or 2017, which the FAA has defined as the threshold for significant noise exposure. No historic properties fall within the 65 DNL contour for the *2012 ESPR* or the *2017 ESPR*. There are no National and State Registers historic districts within the 55 DNL contour in the *2012 ESPR* or the *2017 ESPR*, except for a small portion of MMNHP, which is reduced in size from 2012 to 2017 and is discussed below in Section 10.6.

Two individual National and State Registers-listed properties in Concord have DNL values greater than 55 dBA in 2012 and 2017. The term dBA refers to A-weighted decibel, or sound level, as measured to approximate how the human ear hears different frequencies. Noise levels at both of the following sites have decreased relative to 2012:

- ⇒ The Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace) (NC-18), 341 Virginia Road in Concord at 57.8 dBA; and
- ⇒ The Wheeler-Meriam House (NC-19), 477 Virginia Road in Concord at 57.7 dBA.

The highest DNL noise exposure at a historic National and State Registers noise analysis location in 2017 is 57.8 dBA. This level was calculated at the Deacon John Wheeler/Capt. Jonas Minot Farmhouse (aka Thoreau Birthplace). The 2017 noise value is 0.3 dBA lower than the 2012 value (58.4 dBA), which was 2.0 dBA lower than the 2005 value (60.4 dBA). These were also the highest DNL exposure levels for a historic property in 2005 and 2012.

¹⁵⁹ Some resource numbers are slightly adjusted from 2012 to reflect more accurate GIS mapping.

Table 10-2 Historic Architectural Properties Listed in the National and State Registers of Historic Places in Bedford

MHC #	NAL Label ¹	Name	Street Address	Style-Date	National Register/ State Register Status
BED.V	NB-5	Bedford Depot Park Historic District	80 Loomis St. and 120 South Rd.	Eclectic 1874- 1877	National Register of Historic Places
BED.A	NB-1	Bedford Historic District	Great Road	Various ca. 1730-1850	Local Historic District
BED.Z	NB-2	Old Bedford Center Historic District	Great Road	Various ca. 1730-1860	National Register of Historic Places
BED.K	NB-9	Historic Wilson Mill-Old Burlington Road Area	Old Burlington, Burlington, and Wilson Roads	Various 1676- 1924	National Register of Historic Places
BED.D	HB-1	Veterans Administration Hospital	Springs Road	Georgian Colonial ca. 1920	National Register Determination of Eligibility
BED.21	NB-8	Bacon-Gleason- Blodgett Homestead	118 Wilson Road	Georgian ca. 1750	National Register of Historic Places
BED.23	NB-4	Bedford Old Town Hall	16 South Road	1856	Local Historic District, National Register of Historic Places
BED.37	NB-7	Christopher Page House	50 Old Billerica Road	Federal ca. 1730	National Register of Historic Places
BED.17	NB-6	Nathaniel Page House	89 Page Road	First Period 1687	National Register of Historic Places
BED.AD	NB-3	Old Burying Ground	7 Springs Road	1729	Local Historic District
BED.801	NB-10	Shawsheen Cemetery	Shawsheen Road	1849	National Register of Historic Places
BED.36	NN-11	David Lane House	137 North Road	Federal 1781	National Register of Historic Places
Notes: 1. 2017 Noise Analysis Location label.					

Table 10-3 Historic Architectural Properties Listed in the National and State Registers of Historic Places in Concord

MHC #	NAL Label ¹	Name	Street Address	Style- Date	National Register/ State Register Status
CON.DS	NC-13	American Mile Historic District	Lexington Road	Various ca. 1650-1950	Local Historic District
CON.DT	NC-1	Barrett Farm Historic District	Barrett's Mill and Lowell Roads, Liberty Street	Various ca. 1700-1940	Local Historic District
CON.A	NC-14	Concord Monument Square- Lexington Rd Historic District	Monument Square and Lexington Road	Various ca. 1720-1890	National Register of Historic Places
CON.EA	NC-6	Hubbard-French Historic District	324-374 Sudbury Road	Georgian 1787-1950	National Register of Historic Places
CON.DZ	NC-5	Hubbardville Historic District	324-374 Sudbury Road	Georgian 1787-1950	Local Historic District
CON.DU	NC-9	Main Street Historic District	Main St. bet. Monument Sq. & Wood St.	Various 1757-1976	Local Historic District
CON.C CON.DW CON.EC	Multiple	Minute Man National Historical Park	Lexington and North Great Rds., Massachusetts Ave.	Various ca. 1655-1959	National Historic Landmark, National Register of Historic Places
CON.DV	NC-10	North Bridge- Monument Square Historic District	Monument Sq., Monument St., Lowell Rd.	Various 1635-1979	Local Historic District
CON.177	NC-18	Deacon John Wheeler- Captain Jonas Minot Farmhouse (Henry David Thoreau Birthplace)	341 Virginia Rd.	Colonial ca. 1730	National Register of Historic Places
CON.405	NC-7	Deacon Thomas Hubbard-Judge Henry French House	342 Sudbury Rd.	Georgian ca. 1787	Local Historic District, National Register of Historic Places
CON.241	NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd.	Georgian ca. 1750	Local Historic District, National Register of Historic Places
CON.269	NC-3	Joseph Hosmer House	572 Main St.	Colonial 1672	Local Historic District, National Register of Historic Places

MHC #	NAL Label ¹	Name	Street Address	Style- Date	National Register/ State Register Status
CON.347 CON.EE	MM-6	Old Manse 3	269 Monument St.	Georgian 1769	Local Historic District, National Register of Historic Places National Historic Landmark
CON.170	NC-17	Orchard House	399 Lexington Rd.	Georgian ca. 1750	Local Historic District, National Register of Historic Places National Historic Landmark
CON.414	NC-8	Pest House	158 Fairhaven Rd.	Vernacular ca. 1750	National Register of Historic Places
CON.317	NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike	Greek Revival 1828	Local Historic District, National Register of Historic Places National Historic Landmark
CON.802 (CON.DY)	NC-12	Sleepy Hollow Cemetery	24 Court Ln.	Burial Ground 1823	National Register of Historic Places
CON.56	NC-4	Thoreau-Alcott House	255 Main St.	Greek Revival 1820	Local Historic District, National Register of Historic Places
CON.936	NC-16	Walden Pond 4	MA Rte. 126	Pond 1845	National Register of Historic Places, National Historic Landmark
CON.71 CON.EF	MM-7	The Wayside – Samuel Whitney House 3	455 Lexington Rd.	Colonial ca. 1714	Local Historic District, National Register of Historic Places, National Historic Landmark
CON.178	NC-19	Wheeler-Meriam House	477 Virginia Rd.	Colonial 1690	National Register of Historic Places
CON.329	NC-11	Wright Tavern	1-8 Lexington Rd.	Georgian 1747	Local Historic District, National Register of Historic Places, National Historic Landmark

Notes:

1. 2017 Noise Analysis Location label.

2. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.

3. Old Manse and The Wayside are individually listed National Historic Landmarks in MMNHP.

4. Walden Pond State Reservation is in Concord and Lincoln.

Table 10-4 Historic Architectural Properties Listed in the National and State Registers of Historic Places in Lexington

MHC #	NAL Label ¹	Name	Street Address	Style-Date	National Register/ State Register Status
LEX.AQ	Multiple	Minute Man National Historical Park ²	Lexington and North Great Rds., Mass. Ave.	Various ca. 1655-1959	National Register of Historic Places, National Historic Landmark
LEX.B	OLX-1	Battle Green Historic District	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave., & B&M Railroad	Various 1713-1960	Local Historic District
LEX.E	NLX-15	East Village Historic District	Massachusetts Ave.	Various ca. 1750-1950	Local Historic District
LEX.C	NLX-2	Hancock-Clarke Historic District	12-41 Hancock St., 3-13 Hancock Ave., 8 Goodwin Rd.	Various 1698-1900	Local Historic District
LEX.AG	NLX-6	Lexington Green	Massachusetts Ave., Harrington Rd., Bedford St.	Town Common 1711	Local Historic District, National Register of Historic Places, National Historic Landmark
LEX.AC	NLX-5	Lexington Green Historic District	Massachusetts Ave., Bedford St., Harrington Rd.	Various 1713-1960	Local Historic District, National Register of Historic Places
LEX.D	NLX-12	Munroe Tavern Historic District	Massachusetts Ave.	Various 1700-1900	Local Historic District
LEX.51 LEX.AH	NLX-7	Buckman Tavern	1 Bedford St.	Georgian ca. 1690	Local Historic District, National Register of Historic Places, National Historic Landmark
LEX.52	NLX-4	Garrity-Col. John Parkhurst Meriam House	9 Hancock St.	Federal/ Greek Revival ca. 1830	Local Historic District, National Register of Historic Places, National Historic Landmark
LEX.101	NLX-8	General Samuel Chandler House	8 Goodwin Rd.	Italianate 1846	Local Historic District, National Register of Historic Places
LEX.119	NLX-3	Hancock-Clarke House	35 Hancock St.	Colonial 1698	Local Historic District, National Register of Historic Places, National Historic Landmark

MHC #	NAL Label ¹	Name	Street Address	Style-Date	National Register/ State Register Status
LEX.440	NLX-9	Hancock School	33 Forest St.	Victorian 1890	National Register of Historic Places
LEX.129	NLX-14	John Mason House	1303 Massachusetts Ave.	Federal ca. 1715	Local Historic District, National Register of Historic Places
LEX.127 LEX.128	NLX-13	Sanderson House - Munroe Tavern	1314-1332 Massachusetts Ave.	Colonial ca. 1720	Local Historic District, National Register of Historic Places
LEX.413	NLX-1	Simonds Tavern	331 Bedford Street	Georgian 1795-1810	National Register of Historic Places
LEX.16	NLX-10	United States Post Office	1661 Massachusetts Ave.	Colonial Revival 1938	National Register of Historic Places
LEX.134	NLX-11	Warren E. Sherburne House	11 Percy Rd.	Eclectic 1893	Local Historic District, National Register of Historic Places
LEX.AZ	LEX.	Richard Gleason Tower Estate	39 Marrett Road	Colonial Revival 1905	Local Historic District
Notes: 1. 2017 Noise Analysis Location label. 2. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln.					

Table 10-5 Historic Architectural Properties Listed in the National and State Registers of Historic Places in Lincoln

MHC #	NAL Label ¹	Name	Street Address	Style-Date	National Register/ State Register Status
LIN.A LIN.D	NLN-4	Lincoln Center Historic District	Bedford, Lincoln, Old Lexington, Sandy Pond, Trapelo, & Weston Rds.	Various ca. 1850	Local Historic District National Register of Historic Places
LIN.F LIN.G	Multiple	Minute Man National Historical Park ²	Lexington & North Great Rds., Massachusetts Ave.	Various ca. 1655-1959	National Historic Landmark National Register of Historic Places
LIN.63	NLN-3	Daniel Brooks House	Brooks Rd.	Colonial 1695	National Register of Historic Places

MHC #	NAL Label ¹	Name	Street Address	Style-Date	National Register/ State Register Status
LIN.182	NLN-2	Henry Higginson House	44 Baker Farm Rd.	Tudor Revival 1905	National Register of Historic Places
LIN.60	NLN-5	Hoar Tavern	268 Cambridge Turnpike	Colonial ca. 1713	National Register of Historic Places
LIN.917	NLN-1	Walden Pond ³	MA Rte. 126	Pond 1845	National Register of Historic Places National Historic Landmark
Notes: 1. 2017 Noise Analysis Location label. 2. See Table 10-13 for historic resources in MMNHP in Concord, Lexington, and Lincoln. 3. Walden Pond State Reservation is in Concord and Lincoln.					

Time Above (TA) is a separate noise analysis metric that calculates the time during a 24-hour period that aircraft noise exceeds either a threshold level of 65 dBA (TA65) or 55 dBA (TA55). Time Above 65 dBA indicates periods when speech interference is possible unless the speaker uses a raised voice. Further detail on Time Above analysis is presented in Chapter 7. TA values generally decreased in 2017 when compared to 2012. TA65 values in 2017 range from 0.2 minute a day at the East Village Historic District in Lexington to approximately 27.5 at the Wheeler-Meriam House in Concord (compared to 0.1 and 32.5 in 2012). TA55 values in 2017 range from 2.4 per day at the East Village Historic District to 121.5 minutes per day at the Wheeler-Meriam House (compared to 0.5 to 113 in 2012).

10.4.3 Existing Traffic Conditions for National and State Registers Properties

The relationship of National and State Registers properties and the 10 Traffic Study Area (TSA) intersections is shown in Figure 10-4. In accordance with the EEA Scope for the 2017 *ESPR*, as with standard traffic reviews, traffic associated with Hanscom Field is considered to have a significant impact on an intersection if one or more of the intersection's individual traffic movements consist of 10 percent or more of Hanscom Field-related traffic. For the 2017 *ESPR* traffic analysis, three intersections met this threshold: #5) Hanscom Dr./Old Bedford Rd., Lincoln; #6) Route 2A/Hanscom Dr., Lincoln; and #8) Old Bedford Rd./Virginia Rd., Concord. National and State Registers-listed historic properties are located near #6) Route 2A/Hanscom Dr., Lincoln, which is next to the MMNHP. Hanscom Field contributes less than ten percent at the other 10 *ESPR* study area intersections. Intersections 5, 6 and 8 and nearby historic resources are listed in Table 10-6.

Table 10-6 Historic Architectural Resources in the MHC Inventory and MACRIS near 2017 TSA Intersections

Traffic Study Area Intersection ¹	MHC #	Name	Designation ²
#5) Hanscom Dr./Old Bedford Rd. (Lincoln)	None	None	None
#6) Route 2A /Hanscom Dr. (Lincoln)	Multiple	Minute Man National Historical Park	NHL, NR
#8) Old Bedford Rd./Virginia Rd. (Concord)	CON.BL	Lower Old Bedford Rd./Virginia Rd. Area	MACRIS
	CON.1068	Frank Peterson House	MACRIS (CON.BL)
	CON.1069	Patrick Dalton House	MACRIS (CON.BL)
<p>Notes:</p> <p>1. Based on MEPA Scope Certificate for the 2017 <i>ESPR</i>, Hanscom Field traffic is considered to impact an intersection if one or more of the intersection's individual traffic movement(s) consists of ten or more percent Hanscom Field-related traffic.</p> <p>2. NHL – National Historic Landmark; NR – National Registers of Historic Places; MMNHP – Minute Man National Historical Park; CON.BL – survey area in Concord; MACRIS – Massachusetts Cultural Resource Information System.</p>			

10.4.4 MHC Inventory Resources

The MHC Inventory is a compilation of paper and online database MACRIS inventory forms for historic resources that are typically 50 years old or older. It serves as a basic planning tool for communities and for state and federal agencies in the recording, evaluating, and protecting of historical resources. Resources in the MHC Inventory may not have been formally evaluated and designated as historically significant according to specific regulatory criteria, but the Inventory includes properties that may be eligible for inclusion, and those currently listed, in the National and State Registers. The methodology for the inventory update for the *2017 ESPR* is discussed below.

Within the more than 6,000 acres that comprises the ESPR General Study Area, there are extensive entries of historic resources in the MHC Inventory and MACRIS. For long range planning, the *2012 ESPR* included a baseline comprehensive reconnaissance survey within the General Study Area (see Figure 10-1). Appendix G includes the full baseline set of historic resources information in the *2012 ESPR* with minor updates for the *2017 ESPR*. Twenty-four of the areas/districts and 41 of the individual resources in the Inventory within the ESPR General Study Area are also included, wholly or partially, in the National and State Registers, as noted above in Section 10.4.1.

The *2017 ESPR* focused on updating the reconnaissance survey of resources in the MHC Inventory and MACRIS only within the projected 2035 55 DNL noise contour and within 200-foot diameter around the ten TSA intersections. There have been no major changes to the MHC Inventory and MACRIS in these areas since 2012.

The 2017 update of historic resources identified the following (state total or newly identified) in each town:

- ⇒ Bedford contains two areas within the National Register-listed/NHL MMNHP and 2 survey areas and 14 individual historic resources in the MHC Inventory and MACRIS.
- ⇒ Concord contains 2 National Register-listed individual properties and 6 survey areas and 25 individual historic resources in the MHC Inventory and MACRIS.
- ⇒ Lexington contains 1 National Register-listed individual property and 2 survey areas and 137 individual historic resources in the MHC Inventory and MACRIS.
- ⇒ Lincoln contains 2 areas within the National Register-listed/NHL MMNHP and no survey areas and no individual historic resources in the MHC Inventory and MACRIS.

10.4.5 Existing Noise Conditions for MHC Inventory Resources

Table 10-7 summarizes by town the number of historic resources in the MHC Inventory and MACRIS identified as within the 55 DNL contour in the 2017 existing conditions. Based on reductions in overall noise at Hanscom, the 55 DNL contour is smaller for 2017 than was the case in 2012. As a result, there are fewer historic resources within the 55 DNL contour as compared to 2012, which had 13 of 45 survey areas and 99 of 340 individual properties within

the 55 DNL contour. None of the historic resources in the MHC Inventory and MACRIS are within the 65 DNL contour in 2017, which is consistent with the findings of the 2012 *ESPR*.

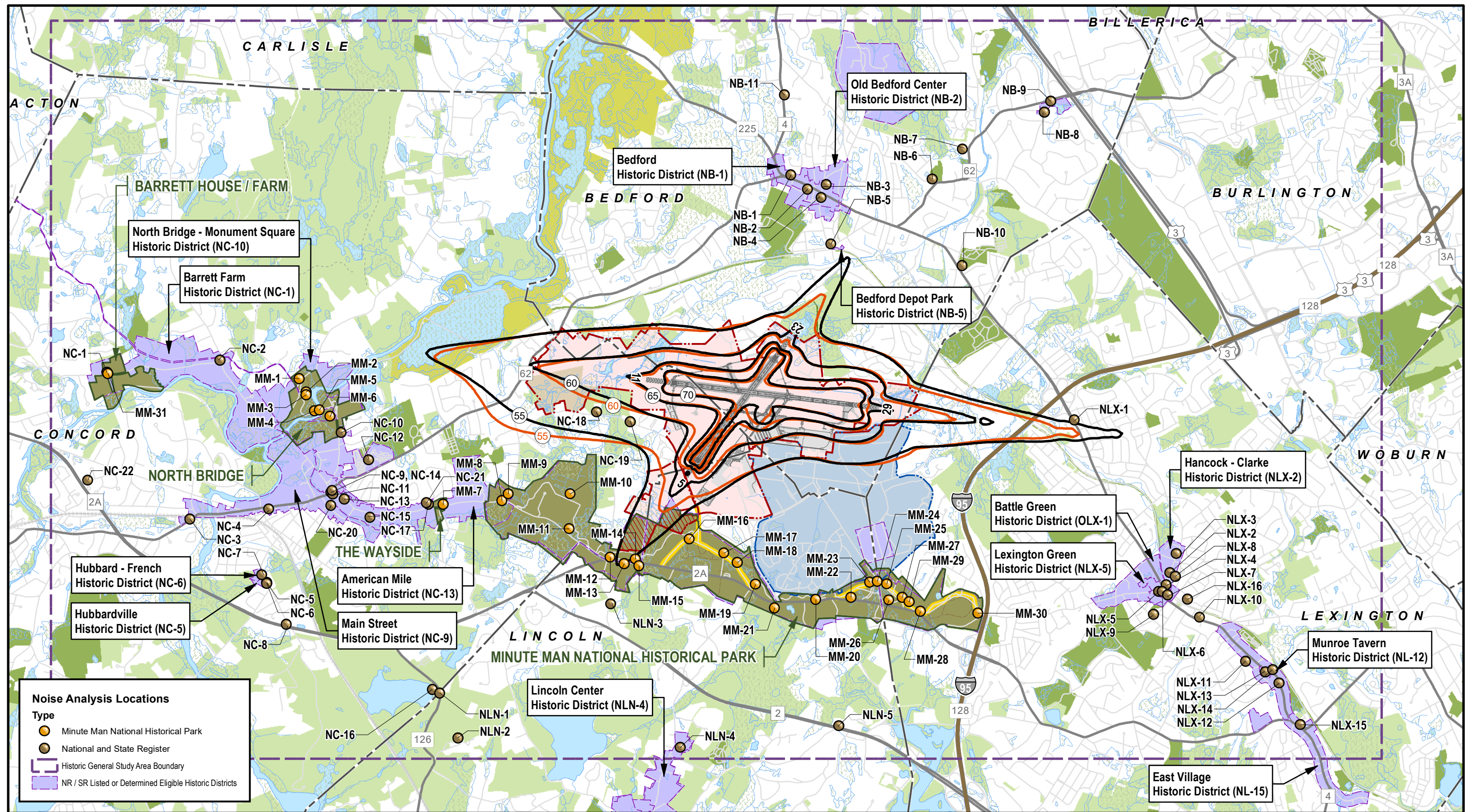
Table 10-7 Comparing MHC Inventory and MACRIS Historic Resources within the 65 and 55 DNL Contours for 2012 and 2017

Location ¹	2012 MHC Inventory	2012		2017 MHC Inventory ²	2017 ³	
		65 dBA	55 dBA		65 dBA	55 dBA
AREAS						
Bedford	6	-	5	2	-	2
Concord	38	-	7	8	-	6
Lexington	1	-	1	2	-	2
Lincoln	-	-	-	2	-	2
Total	45	0	13	14	0	12
INDIVIDUAL PROPERTIES						
Bedford	59	-	19	14	-	12
Concord	218	-	47	25	-	17
Lexington	63	-	33	137	-	56
Lincoln	-	-	0	-	-	-
Total	340	0	99	176	0	85
Notes: 1. Based on research for the 2017 <i>ESPR</i> . 2. Appendix G lists these historic resources. 3. The numbers of areas listed are fully or partially within the 55 DNL contour.						

10.4.6 Existing Traffic Conditions for MHC Inventory Resources

Ten traffic intersections were studied for the 2017 *ESPR*. Historic resources are located at 8 of the 10 traffic study area intersections, with no resources at #1 Route 4/225 (Great Rd)/Hartwell Ave (Lexington) and #5 Hanscom Drive/Old Bedford Road (Lincoln). Three intersections meet the study threshold of 10 percent of traffic generated by Hanscom Field: #5 Hanscom Dr./Old Bedford Rd. (Lincoln), #6 Route 2A/Hanscom Dr. (Lincoln), and #8 Old Bedford Rd./Virginia Rd. (Concord). There are one area and two individual resources in the MHC Inventory and MACRIS near #8 Old Bedford Road/Virginia Rd. These intersections and historic resources are listed in Appendix G.

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Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018



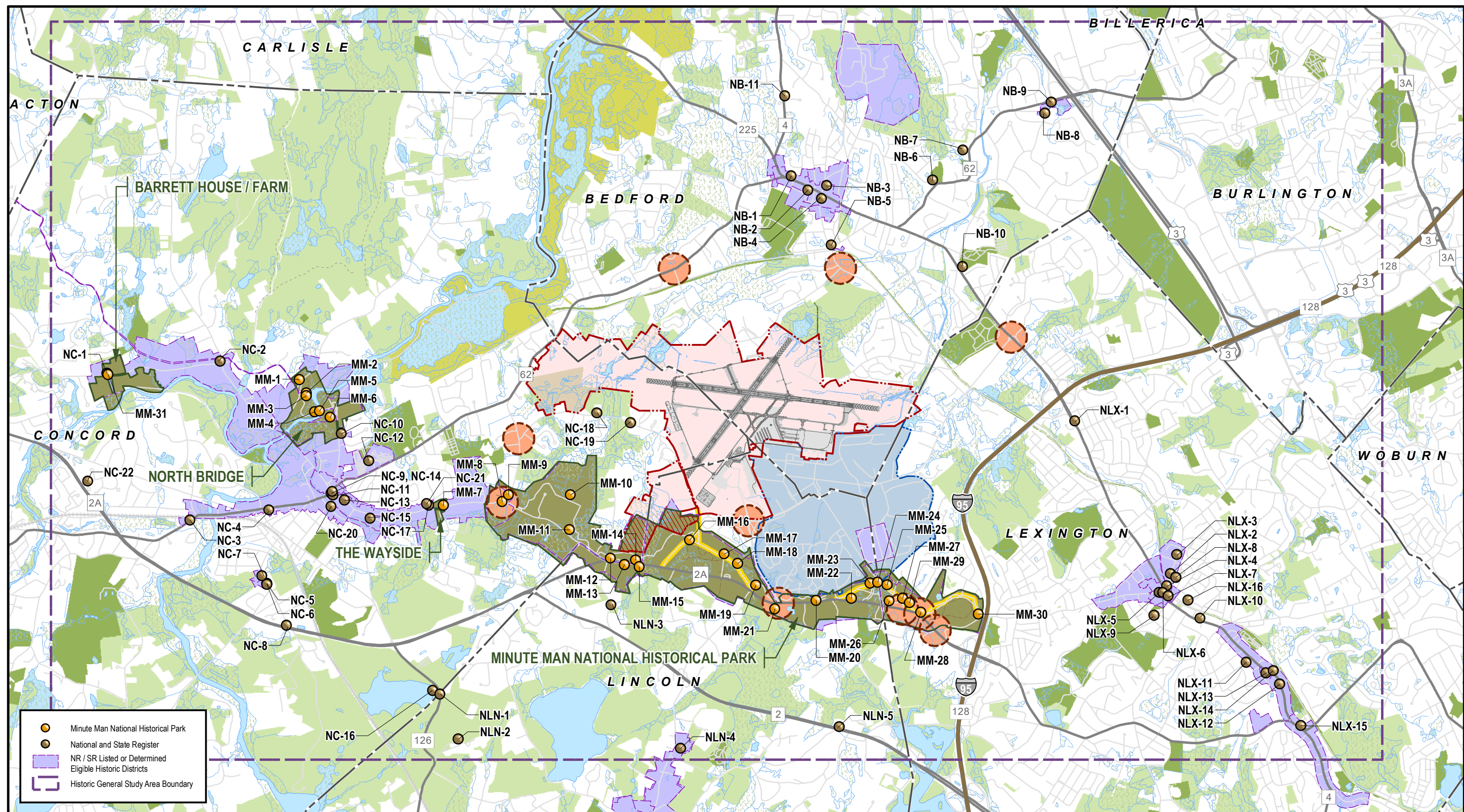
L. G. Hanscom Field
2017 Environmental Status & Planning Report

Historic Resources within the 2012
and 2017 DNL Noise Contours

Figure 10-3



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Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

Figure 10-4



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10.5 Local Historical Commissions

Meetings were held with the local historical commissions in Bedford, Concord, Lexington, and Lincoln and with representatives of the MMNHP (discussed separately below) to explain the purpose and process of the ESPR and to collect updated data on any additional notable historic resources updated since the *2012 ESPR*. Each historical commission provided information about updates to the MHC Inventory and historic districts and individual historic resources that are listed or may be eligible for listing in the National and State Registers for consideration as noise analysis locations for the *2017 ESPR* noise analysis:

- ⇒ Bedford Historic Preservation Commission noted that the existing Old Bedford Center Historic District was expanded in 2014 and one property is pending listing, David Fitch House, 109 Old Billerica Road. Neither the Town of Bedford nor any other entity has made new entries in the MHC Inventory or other new National and State Registers listings within the *2017 ESPR* General Study Area.
- ⇒ Concord Historical Commission noted that neither the Town of Concord nor any other entity has made new entries in the MHC Inventory or new National and State Registers listings within the *2017 ESPR* General Study Area.
- ⇒ Lexington Historical Commission noted that two areas have been added to the MHC Inventory and MACRIS, the Lexington Manor Area partially within the 2035 55 DNL noise contour and Meriam Hill within the *2017 ESPR* General Study Area. There are no new National and State Registers listings within the *2017 ESPR* General Study Area.
- ⇒ Lincoln Historical Commission stated that one property in the *2017 ESPR* General Study Area, 5 Partridge Lane, is being designated a Local Landmark and will be added to the MHC Inventory, MACRIS, and the State Register. Neither the Town of Lincoln nor any other entity has made new entries in the MHC Inventory or other new National and State Registers listings within the *2017 ESPR* General Study Area.

10.6 Reconnaissance Survey Update

To support the *2017 ESPR* analyses, an update of the reconnaissance-level historic and archaeological surveys was conducted.¹⁶⁰

10.6.1 Historic Resources

The 2017 historic resources survey information consistent with the 2017 Secretary of the Interior and MHC standards was the basis for the analysis of noise, traffic and other factors

¹⁶⁰ Adams et al. 2018; Banister and Herbster 2018. See footnotes 1, 4, and 5.

discussed in this chapter. The survey update for the *2017 ESPR* covered the Reconnaissance Survey Area within Hanscom Field, the forecasted 2035 55 DNL contour and 200 feet around the 10 TSAs. A drive-by/walkover of the Reconnaissance Study Area was completed to verify any changes in the status of previously recorded and any new historic resources since the reconnaissance survey update for the *2012 ESPR*. During the field review, information on properties that have been listed in the National or State Registers or that are unrecorded and have reached 50 years of age since 2012, as well as major demolitions, new construction, or alterations were recorded in written notes, digital photographs, and located on a base map. In addition, all National and State Registers-listed properties within the General Study Area were field-verified.

The 2017 survey update used current Geographic Information System (GIS) mapping, including MACRIS, and indicated the boundary of the General Study Area and the Reconnaissance Study Area. The locations of National and State Registers properties and historic resources in the MHC Inventory were mapped using the GIS mapping function of the MACRIS online database. The high level of accuracy in current GIS mapping resulted in a few minor corrections to the 2012 survey information in the *2017 ESPR*. This information is summarized in Appendix G.

10.6.2 55 DNL Noise Contour for 2035 in Bedford, Concord, Lexington, and Lincoln, Historic Resources

The Reconnaissance Survey Area update within the 55 DNL noise contour for the projected 2035 planning scenario identified three individual National and State Registers-listed properties, portions of MMNHP, and all or part of 10 survey areas and 179 individual properties in the Inventory and MACRIS in Bedford, Concord, and Lexington. A summary of these 2017 results is presented here. The National and State Registers properties are shown in Figure 10-3. These resources are listed in Appendix G:

- ⇒ Bedford: There are no National or State Registers historic resources. For historic resources in the Inventory and MACRIS, there are two survey areas and 14 individual resources, including a small portion of the Hartwell Town Forest.
- ⇒ Concord: There are a portion of MMNHP and two individual National Register-listed historic properties, the Deacon John Wheeler – Capt. Jonas Minot House, 341 Virginia Road, and the Wheeler-Merriam House, 477 Virginia Road. For historic resources in the Inventory and MACRIS, there are six survey areas and 25 individual resources.
- ⇒ Lexington: There are a portion of MMMHP and one National Register-listed historic property, Simonds Tavern, 331 Bedford Street. For historic resources in the Inventory and MACRIS, there are two survey areas and 140 individual resources.
- ⇒ Lincoln: There are no National or State Registers historic resources, nor any historic resources in the Inventory and MACRIS.
- ⇒ Hanscom Field: The reconnaissance survey update completed for the *2017 ESPR* identified a total of seven buildings within Hanscom Field proper that are currently 50

years old or older. Since the *2012 ESPR*, three resources 50 years old or older have been removed, Hangars 12A, 16, and 17. Massport consulted with the MHC and there was a determination that the buildings were not eligible for the National Register, therefore, no historic properties were affected by the proposed demolition actions.¹⁶¹

- ⇒ Hanscom AFB: Portions of Hanscom AFB and Massport property leased by the U.S. Air Force are located within the 2017 55 DNL contour, including the north one-quarter of the main Base. One resource in the General Study Area, but outside the Reconnaissance Study Area boundary, the Air Force Cambridge Research Laboratories Historic District, has been determined eligible for the National Register.

10.6.3 Traffic Study Areas, Historic Resources

The traffic study areas are shown in Figure 10-4, and the resources at each location are listed in Appendix G. The reconnaissance survey update completed for the 10 TSA intersections included in the *2017 ESPR* identified no historic resources at two of the TSAs, numbered 1 and 5. Five of the TSAs fall within the boundaries of the MMNHP, numbered 2, 3, 4, 6, and 7.

Inventoried historic resources also are present, outside of the MMNHP boundaries, at TSA number 10. As in the *2012 ESPR* survey, the survey update for the *2017 ESPR* verified that all historic resources within the 10 TSAs were already included in the MHC Inventory and MACRIS and/or the State and National Registers. No previously undocumented historic resources were identified at any of the TSAs.

10.7 Environmental Effects for Historic Resources

As presented in Chapter 7, no historic resources noise analysis locations are projected to experience a DNL greater than 60 dB under the 2025 or 2035 scenarios. The Deacon John Wheeler/Capt. Jonas Minot Farmhouse and the Wheeler-Meriam House, both in Concord, and Simonds Tavern in Lexington are the only three sites with a DNL of 55 dB or greater in the forecasted scenarios. The projected future noise levels at the Deacon John Wheeler/Capt. Jonas Minot Farmhouse and the Wheeler-Meriam House show a slight increase and at the Simonds Tavern are reduced from the *2012 ESPR* scenarios.

In Bedford, no historic resource noise analysis locations are exposed to a DNL of 55 dBA or above in 2017, or in the 2025 and 2035 scenarios. The property with the highest exposure level is Bedford Depot Park Historic District (NB-5), which has DNL exposure value of 52.0 dBA in 2017 and projected exposures in the planning scenarios of 51.6 dBA in 2025 and 52.1 dBA in 2035.

¹⁶¹ Hangar 12A: Letter, Massport to MHC, February 6, 2017, and MHC concurrence, March 24, 2017. Building 16: xxxx. Hangar 17: Massport, Jet Aviation Final Environmental Assessment, 2014.

In Concord, two historic properties have current and projected DNL noise exposure values between 55 and 60 dBA:

- ⇒ The Deacon John Wheeler/Capt. Jonas Minot Farmhouse (NC-18), 341 Virginia Road, has a current noise exposure level of 57.8 dBA and in the planning scenarios has values of 58.6 dBA in 2025 and 59.0 in 2035. These forecasted levels are reduced from the 2020 and 2030 forecasts, which in 2012 were estimated to be 58.7 and 59.8, respectively.
- ⇒ The Wheeler-Meriam House (NC-19), 477 Virginia Road, has a current noise exposure level of 57.7 dBA and in the planning scenarios has values of 58.4 dBA in 2025 and 58.8 in 2035. These levels are similar to the 2020 and 2030 forecasts, which in 2012 were estimated to be 58.4 and 59.4, respectively.

In Lexington, there are no historic sites with 2017 DNL noise values above 55 dBA. The property with the highest exposure in 2017 is Simonds Tavern (NLX-1), 331 Bedford Street, with a value of 54.5 dBA. In the forecast scenarios, Simonds Tavern has exposure levels of 55.3 dBA in 2025 and 55.9 dBA in 2035. In Lincoln, no historic resource noise analysis location are exposed to a DNL of 55 dBA or above in 2017, or in the 2025 and 2035 scenarios. The property with the highest noise exposure level is the Daniel Brooks House (NLN-3), which has a DNL exposure value of 51.9 dBA in 2017 and projected exposures in the planning scenarios of 50.8 dBA in 2025 and 51.2 dBA in 2035, both below existing conditions.

As stated previously, three of the 10 TSA intersections studied for the *2017 ESPR* meet the threshold of 10 percent of traffic generated by Hanscom Field: #5 Hanscom Dr./Old Bedford Rd. (Lincoln), #6 Route 2A/Hanscom Dr. (Lincoln), and #8 Old Bedford Rd./Virginia Rd. (Concord). There are no historic resources near #5 Hanscom Dr./Old Bedford Rd. Intersection #6 Route 2A/Hanscom Dr. is near Minute Man National Historical Park, and #8 Old Bedford Rd./Virginia Rd. has one area and two individual resources in the MHC Inventory and MACRIS (see Table 10-7). As discussed in Chapter 6, Ground Transportation, no physical modifications are proposed by Massport for these intersections. As described in Chapter 8 Air Quality, there are no adverse effects attributable to air quality in the 2025 and 2035 scenarios.

10.8 Archaeological Resources

The archaeological reconnaissance survey completed in the towns of Bedford, Concord, Lexington, and Lincoln for the *2012 ESPR* was updated for the *2017 ESPR*. The reconnaissance survey was conducted within the Hanscom Field property boundaries and within a 200-foot radius of 10 traffic study intersections. The primary objectives of the reconnaissance survey were to identify the locations of documented archaeological sites and archaeologically sensitive areas within Hanscom Field and near the traffic study intersections.

10.8.1 Methodology for Archaeological Resources

The archaeological survey used results of the 2012 *ESPR* and other previous surveys, including archival research, informant interviews, and field walkover, that provide information about known and potential archaeological resource areas. This information was used to compile environmental and cultural pre-contact and post-contact contexts for the periods before and after initial European contact with New England, about AD 1500, and to develop sensitivity models for undocumented archaeological sites.

For the 2017 *ESPR* survey update, a site file review and field walkover were conducted to update recorded archeological sites and sensitive areas within Hanscom Field and near 10 traffic study intersections to assess any environmental changes that have occurred since the survey for the 2012 *ESPR*.

Table 10-8 Pre-Contact and Post-Contact Archaeological Sites in the MHC Inventory of the Archaeological Asset of the Commonwealth in Bedford near Hanscom Field

MHC Site #	Site Name	Temporal Association	Site Type
19-MD-77	M-23-54	PaleoIndian	Campsite
19-MD-78	M-23-116	Unknown	Campsite
19-MD-889	Wamesit Crossing	Unknown	Find Spot
19-MD-994	Turf Meadow	Unknown	Lithic Scatter
19-MD-1022	Hanscom School Findspot	Middle Archaic	Find Spot
19-MD-1023	Fitch Farm Native American Site	Early Archaic – Late Woodland	Campsite
BED-HA-6	HAFB-2	20 th C.	Other
BED-HA-7	West Railroad Station Site	19 th C.	Transportation
BED-HA-11	Town Center Railroad Station And Coal Yard	19 th – 20 th C.	Transportation
BED-HA-20	Boston & Lowell Railroad Line Site	19 th – 20 th C.	Transportation
BED-HA-22	Princeton At Bedford 1	19 th – 20 th C.	Agriculture Other
BED-HA-23	South School Site	19 th C.	Education
BED-HA-24	Barn Foundation Site	Unknown	Agriculture
BED-HA-27	Yellow Ochre Mine Site	19 th C.	Industry
BED-HA-28	William W Mudge Garden	19 th C.	Agriculture
BED-HA-29	Wheeler Mill Site	Unknown	Industry
BED-HA-30	West School Site	19 th C.	Education

Table 10-9 Pre-Contact and Post-Contact Archaeological Sites in the MHC Inventory of the Archaeological Assets of the Commonwealth in Concord near Hanscom Field

MHC Site #	Site Name	Temporal Association	Site Type
19-MD-79	Munson Farm	Late Archaic	Campsite
19-MD-80	Munson Farm 2	Unkown	Campsite
19-MD-111	Meriam's Corner (MMNHP)	Middle-Late Archaic	Campsite
19-MD-180	Revolutionary Ridge (MMNHP)	Unknown	Campsite
19-MD-472	Pine Hill (Elm Brook Farm)	Unknown	Campsite
19-MD-687	Ox Pasture (MMNHP)	Unknown	Camp
19-MD-946	Fox House	Middle-Late Archaic	Campsite
19-MD-948	Kaveski Farm	Unknown	Find Spot
19-MD-1008	Joshua Brooks	Unknown	Lithic Workshop
19-MD-1010	Vossberg	Unknown	Find Spot
19-MD-1028	Fox House Site	Early-Late Archaic	Listed "Cultivated field"; likely campsite
19-MD-1000	Wayside	Middle Archaic	Find Spot
19-MD-1001	Eliphelet Fox House Site	Unknown	Campsite
19-MD-86	Asparagus Farm/Peter's Field	PaleoIndian-Woodland	Burial
19-MD-97	Campsite 3	Late Archaic	Campsite
19-MD-98	Campsite 2	Middle-Late Archaic	Campsite
19-MD-74	Balls Hill	Late Archaic	Unkown
19-MD-112		Middle Archaic-Woodland	Campsite
19-MD-1149	Burke House Site	Middle-Late Woodland	Campsite
19-MD-1150	Farwell Jones Find Spot	Late Archaic	Find Spot
19-MD-397		Late Archaic	Campsite
19-MD-412	Asparagus Farm/Davis Farm	Middle Archaic-Early Woodland	Unkown
19-MD-476	North Of Revolutionary Ridge	Archaic, Contact	Lithic Workshop
19-MD-527	Dee's Farm	Unknown	Lithic Workshop
CON-HA-14	Eliphelt Fox House Site (Casey's House)	17th- 19 th C.	Other

MHC Site #	Site Name	Temporal Association	Site Type
CON-HA-15	Wayside	18 th – 20 th C.	Other
CON-HA-19	Job Brooks Site	18 th – 19 th C.	Other
CON-HA-24	Ebenezer Peirce Homestead	Unkown	Other Agriculture
CON-HA-25	George Minott Homestead	Unkown	Other Agriculture
CON-HA-26	Meriam House	Unkown	Other
CON-HA-30	Mary Ingall Site	Unkown	Other
CON-HA-33	Albano Barn Foundation	20 th C.	Agriculture
CON-HA-34	Hastings Barn Foundation	19 th C.	Agriculture

Table 10-10 Pre-Contact and Post-Contact Archaeological Sites in the MHC Inventory of the Archaeological Assets of the Commonwealth in Lexington near Hanscom Field

MHC Site #	Site Name	Temporal Association	Site Type
19-MD-685	Thomas Nelson Jr. Farm P1 (MMNHP)	Unknown	Activity Area
19-MD-688	Jacob Whittemore Farm P1 (MMNHP)	Middle Archaic	Campsite/workshop
19-MD-1005	David Fiske Site	Unknown	Lithic Scatter
LEX-HA-6	Thomas Nelson Farm Site	18 th C.	Archaeology, Historic Agriculture Military
LEX-HA-7	The Ebenezer Fiske Site	17 th – 20 th C.	Agriculture Other
LEX-HA-8	The David Fiske Site	17 th – 18 th C.	Agriculture Other
LEX-HA-9	HAFB-1	20 th C.	Other Residential
LEX-HA-13	Battle Road On Fiske Hill	18 th C.	Industry
LEX-HA-14	Blacksmith Shop	17 th – 20 th C.	Other Agriculture
LEX-HA-16	Bashian Barn Foundation	Unknown	Agriculture
LEX-HA-17	Parker's Revenge	18 th C.	Military

Table 10-11 Pre-Contact and Post-Contact Archaeological Sites in the MHC Inventory of the Archaeological Assets of the Commonwealth in Lincoln near Hanscom Field

MHC Site #	Site Name	Temporal Association	Site Type
19-MD-119	Hartwell Farm	Woodland	Campsite
19-MD-587	Black Rabbit ¹	Late/Transitional Archaic	Campsite (fall/winter)
19-MD-588	Black Walnut	Unknown	Campsite
19-MD-589	Perk Site	Unknown	Chipping Station
19-MD-676	William Smith Farm P2 (MMNHP)	Unknown	Campsite
19-MD-677	Joshua Brooks Farm P1 (MMNHP)	Unknown	Campsite
19-MD-678	Ephraim Hartwell Farm P4 (MMNHP)	Unknown	Campsite
19-MD-679	Ephraim Hartwell Farm P3 (MMNHP)	Unknown	Campsite
19-MD-680	William Smith Farm P1 (MMNHP)	Unknown	Campsite
19-MD-681	Aaron Brooks Farm P1 (MMNHP)	Unknown	Campsite
19-MD-682	Ephraim Hartwell Farm P2 (MMNHP)	Unknown	Campsite
19-MD-683	Ephraim Hartwell Farm P1 (MMNHP)	Unknown	Campsite
19-MD-684	Thomas Nelson Jr. Farm P2 (MMNHP)	Unknown	Campsite
19-MD-686	Holt Pasture (MMNHP)	Unknown	Campsite
19-MD-995	Block 2	Unknown	Find Spot
19-MD-996	Captain W. Smith House Findspot 1 (MMNHP)	Unknown	Find Spot
19-MD-997	Rogers Property (MMNHP)	Middle-Late Archaic	Flake Scatter
19-MD-1006	Joseph Mason Site (MMNHP)	Unknown (possibly Woodland)	Campsite
19-MD-1007	Daniel Brown Site	Unknown	Lithic Scatter
LIN-HA-2	Corner House	19 th - 20 th C.	Agriculture Other
LIN-HA-3	19th Century Cottage and Barn	19th- 20th C.	Agriculture Other
LIN-HA-4	Hartwell Tavern	18 th – 20 th C.	Agriculture Commerce
LIN-HA-6	Thomas Nelson Jr. House	18 th – 19 th C.	Other
LIN-HA-7	Site 23	18 th C.	Other
LIN-HA-8	Josiah Nelson House Site	18th – 20th C.	Other
LIN-HA-9	Site 22	18th C.	Other
LIN-HA-21	Site Old Hop House	19 th C.	Agriculture Industry

MHC Site #	Site Name	Temporal Association	Site Type
LIN-HA-22	Joseph Mason Site	17 th – 19 th C.	Other
LIN-HA-23	Rogers Property Site	18 th – 20 th C.	Other Agriculture
LIN-HA-46	Brooks Saw Mill Dam	18 th C.	Industry
LIN-HA-47	Ebenezer Lameson Homestead	Unknown	Other Agriculture
LIN-HA-48	Nathan Whittemore Homestead	Unknown	Other Agriculture
LIN-HA-49	Jacob Foster Homestead	Unknown	Other Agriculture
LIN-HA-50	Ebenezer Lameson Homestead 2	Unknown	Other Agriculture
LIN-HA-51	Schoolhouse	18 th C.	Other
LIN-HA-52	Thomas Brooks Farm Foundation	19 th C.	Agriculture
LIN-HA-53	Lincoln Boulder Structures	Unknown	Other
Notes: 1. The Black Rabbit Site has a State Preservation Restriction.			

10.8.2 National and State Registers, Archaeological Resources

A review of the current National and State Registers, site files of the MHC Inventory, and MACRIS maintained by the MHC was completed for the 2017 *ESPR* to identify recorded archaeological sites within and in proximity to Hanscom Field. The review consulted previously conducted cultural resource management studies conducted within or adjacent to Hanscom Field.^{162, 163, 164, 165}

The site file review update for the 2017 *ESPR* concluded that no new pre- or post-contact archaeological sites have been recorded within the survey area or the 10 TSAs since the 2012 *ESPR*. There were also no new recorded survey reports listed.

Table 10-8, Table 10-9, Table 10-10, and Table 10-11 list the archeological sites that have been identified in Bedford, Concord, Lexington, and Lincoln within and/or in a half-mile radius of Hanscom Field. Other than 19-MD-587, none of these sites has been evaluated for eligibility in the State and National Registers. A total of six archaeological sites have been documented either completely or partially within the Hanscom Field boundaries. These include three pre-contact period sites (Pine Hill [19-MD-472], Fox House [19-MD-1028], and Hartwell Farm [19-MD-119]) and three post- contact period sites (Wheeler Mill [BED-HA-29], Yellow Ochre Mine [BED-HA-27], and South School [BED-HA-23]). To date, no below-ground archaeological

¹⁶² King (PAL), Archaeological Reconnaissance Survey of Hanscom Air Force Base, 1992.

¹⁶³ Ritchie et al. (PAL), Archaeological Investigations of Minute Man National Historical Park, Concord, Lexington, and Lincoln, Massachusetts, 1990.

¹⁶⁴ Herbster (PAL), Archeological Overview and Assessment, Minute Man National Historical Park, Concord, Lexington, and Lincoln, Massachusetts, 2005.

¹⁶⁵ Banister and Herbster (PAL) 2006; Banister and Herbster (PAL) 2013. See footnote 5.

investigations have been conducted for any of these sites and their eligibility for listing in the National Register has not been determined.

10.8.3 Reconnaissance Survey of Hanscom Field, Archaeological Resources

Past reconnaissance archaeological surveys of Hanscom Field have found that a few relatively undisturbed portions exist, including tracts of woodland peripheral to the runways, terminal, and supporting facilities. These areas generally contain secondary growth woodlands with both deciduous and coniferous species of trees. Interspersed are wetland areas and some drainage improvements/alterations to the existing waterways. Most of Hanscom Field, however, has been previously disturbed by construction. Disturbance activities include landfilling, installation of utilities, and construction of buildings, parking lots, roadways, and runways. Areas of high pre-contact archaeological sensitivity in Hanscom Field and around intersections include previously undisturbed, dry, level areas located adjacent to the natural brooks and wetlands in the peripheral portions of the project area. The extreme southern portion of Hanscom Field and the intersections along Route 2A were assigned moderate to high archaeological sensitivity for post-contact resources associated with the April 19, 1775 engagement along Battle Road, now part of the MMNHP.

A portion of the North Airfield Area now developed as a sports center with two outdoor turf fields was designated as a low sensitivity area for both pre and post-contact archaeological resources.

The 2017 field walkover noted no areas where new development has occurred within the moderate and high sensitivity areas since the 2012 *ESPR*. Some changes to the built environment were noted during the field walkover within the Hanscom Field property boundary, however all changes were within areas previously assessed as having low archaeological sensitivity and the sensitivity for these areas remains the same for the 2017 *ESPR*.

No other portions of the Hanscom Field study area or any areas managed by the Transportation Security Agency (e.g. airside secure areas) have undergone new development since the reconnaissance survey for the 2012 *ESPR*, and the sensitivity for these areas remains the same for the 2017 *ESPR*.

10.8.4 Proximity of Sites to TSAs, Archaeological Resources

As presented in Table 10-12, a total of 17 archaeological sites have been documented within a 200 foot-radius at five of the 10 TSA intersections. This total includes 10 pre-contact and 7 post-contact period sites, of which 14 are within the boundaries of MMNHP. Five of the intersections were determined to have areas that are undisturbed, defined as no obvious signs of previous ground disturbance, except for the immediate intersection right-of-way. The condition of three intersection areas was assessed as unknown due to intersection

improvements, and one intersection area appeared to have both undisturbed and recently disturbed areas.

Table 10-12 Pre-Contact and Post-contact Archaeological Resources at Traffic Study Area Intersections

Intersection	Archaeological Sites	Condition ¹
#1) Route 4-225/Hartwell Ave. (Lexington)	None documented	Unknown/intersection improvements
#2) Mass. Ave./Rte 2A (Lexington)	None documented	Unknown/intersection improvements
#3) Old Mass. Ave./Rte. 2A (Lexington)	19-MD-688 (MMNHP) LEX-HA-13 (MMNHP) LEX-HA-15 (MMNHP)	Undisturbed
#4) Airport Rd./Rte. 2A (Lexington)	19-MD-684 (MMNHP) 19-MD-685 (MMNHP) 19-MD-688 (MMNHP) LEX-HA-12 (MMNHP) LEX-HA-13 (MMNHP)	Undisturbed
#5) Hanscom Dr./Old Bedford Rd. (Lincoln)	19-MD-587	Unknown/intersection improvements
#6) Hanscom Dr./Rte. 2A (Lincoln)	19-MD-678 (MMNHP) 19-MD-679 (MMNHP) 19-MD-682 (MMNHP) 19-MD-683 (MMNHP)	North Side = disturbed (recent construction for pedestrian underpass); South Side= Undisturbed
#7) Old Bedford Rd./Lexington Rd. (Concord)	19-MD-111 (MMNHP) 19-MD-180 (MMNHP) CON-HA-26 CON-HA-27 CON-HA-31	Undisturbed
#8) Old Bedford Rd./Virginia Rd. (Concord)	None documented	Undisturbed; possible house lot/landscaping disturbance
#9) Hartwell Rd./Rte. 62 (Bedford)	None documented	Undisturbed; possible house lot/landscaping disturbance
#10) South Rd./Hartwell Rd. (Bedford)	None documented	Undisturbed; possible house lot/landscaping disturbance
Notes: Undisturbed (no obvious signs of previous disturbance) except for immediate intersection right-of-way.		

10.8.5 Environmental Effects for Archaeological Resources

Proximity of Sites to TSAs, Archaeological Resources

There are several new redevelopment activities projected at Hanscom Field in Chapter 2 Facilities and Infrastructure in the 2025 and 2035 scenarios with the potential for ground disturbance in sensitive areas. Therefore there is the potential for effects to archaeological sites or sensitive areas for the 2025 and 2035 scenarios. Specific projects will be assessed as appropriate for impacts at the time of development. No physical changes are forecasted at the three traffic intersections that meet the threshold for analysis, so there will be no effects to any archaeological sites or sensitive areas in 2025 and 2035.

10.9 Minute Man National Historical Park (MMNHP)

MMNHP (the Park) is operated by the NPS. Since 1959, when MMNHP was created within the towns of Concord, Lexington, and Lincoln, the Park and Hanscom have been neighbors. As two regionally and nationally significant land uses, MMNHP and Hanscom Field encounter both shared investment in the improvement of the region and the need for visitor access. A meeting was held with the NPS on July 27, 2018 to solicit input on the 2017 *ESPR* and communicate periodically to discuss Hanscom Field and its relationship to MMNHP.

10.9.1 Visitation Levels

The NPS has reported that as of 2017, visitation to the Park is trending slightly upwards, with more than one million people visiting the facilities and attending the programs of MMNHP annually. The Park is recognized as an important asset to the region and the nation. The park sits in the suburbs of a major metropolitan area with modern, vibrant and expanding residential, industrial and commercial sectors.

Major attractions are the North Bridge area in Concord and the Visitor Center off North Great Road in the Battle Road Park unit in Lincoln. Two parking lots at the North Bridge unit and one at the Visitor Center accommodate auto and bus parking; six other parking lots are located in the Park. While the park is open year-round, its main season is the seven-month period between April and October. The early spring, starting with Patriot's Day in Massachusetts, represents the first major influx of park visitors. Fall foliage season is the other very popular period. The park is open daily from sun-up to sundown, but buildings are generally open from 9 a.m. to 5 p.m.

10.9.2 Overview of Park

MMNHP is the largest National and State Registers resource in the vicinity of Hanscom Field. It consists of four discontinuous sections referred to as the Battle Road, Wayside, North Bridge and Barrett Farm units, which are illustrated in Figures 10-5 and 10-6. The park covers

approximately 970 acres along Route 2A in Concord, Lexington, and Lincoln and off Monument Street in Concord.

When Congress created MMNHP in 1959, Hanscom Field had already been operating for 18 years, having been established by the Commonwealth in 1941. A portion of the Congressional boundaries of the Park, comprising 50 acres in Lincoln, is within Massport land at the southwest area of Hanscom Field. There are no buildings or structures on this wooded parcel.

MMNHP itself and a number of individual historic properties within the Park are historic resources of national significance that are designated National Historic Landmarks. The Park is nationally significant as the site of the Battle of Concord, one of the two battles that marked the beginning of the Revolutionary War; for its association with prominent literary figures of the nineteenth and twentieth centuries; and as one of the earliest places in the nation to be commemorated. The Park was created to preserve and interpret the historic sites, structures, and properties that exist along the route of battle that took place in April 1775. The Col. Barrett Farm unit in Concord is also individually listed in the National Register as the Col. James Barrett House.

Battle Road Unit

The Battle Road unit, the largest unit, covers approximately 849 acres and stretches five miles along present-day Route 2A, consisting of Lexington Road (Concord), North Great Road (Lincoln), and Massachusetts Avenue (Lexington). At the time of the battle, as today, the road was a much traveled regional route that linked the town of Concord with Cambridge, Boston, and the sea. Some sections of the Battle Road have been restored to their unpaved appearance, while others form parts of the paved automobile road (Route 2A). The original route is readily discernible and is lined almost continuously with stone walls in the central and eastern parts of the park unit. Hanscom Field, Hanscom AFB, and its associated military housing abut the northern boundary of the eastern half of the Battle Road unit.

Modern residential developments line much of the southern boundary, and the interstate highway and commercial/office developments mark the east terminus at Route 128/I-95.

Two of the 10 traffic study intersections are located within the Battle Road Unit of the MMNHP. All of the areas around the intersections encompass historic farming and/or wooded landscapes, and five contain historic buildings.

The Wayside Unit

The Wayside unit is the smallest section, containing approximately six acres on the north side of Route 2A in Concord. This unit centers around The Wayside, the home of three notable American authors: Louisa May Alcott, Nathaniel Hawthorne, and Margaret Sidney.

North Bridge Unit

The North Bridge unit contains approximately 112 acres in Concord and is crossed by the Concord River. It contains the North Bridge where, on April 19, 1775, Colonial militia men fired the famous "shot heard 'round the world." The surrounding tranquil, commemorative landscape includes Daniel Chester French's Minute Man Statue.

Barrett Farm Unit

The Barrett's Farm unit contains the Col. James Barrett Farm and 3.4 acres of land at 448 Barrett's Mill Road in Concord. Built in 1705, it was the house of James Barrett, a Colonel of the Concord, Massachusetts Militia during the Battles of Lexington and Concord on April 19, 1775, and a site where colonial militia munitions were stored.

10.9.3 Park Environs and Landscape Features

The MMNHP landscapes and habitats are dominated by forests that cover approximately 500 acres, including about 200 acres of forested wetlands. Non-forested wetlands, including several ponds, constitute approximately 180 acres within the park. Open meadows and fields cover an additional 250 acres, including approximately 100 acres that are farmed under the park's agricultural leasing program. Shrublands characterize the interface of fields and forests. The remainder of the park contains developed areas, including roads, parking lots, and buildings.

The park today is generally characterized by low-density residential development set in a landscape of open pastures, interspersed with woodland and marshes. However, as noted in the updated National Register nomination dated 2001, areas within the present-day park underwent significant change between 1775 and 1959. The area remained agricultural well into the nineteenth century, but intensive residential development occurred as the area became part of Boston's commuting community during the early and mid-twentieth century. The improvement of existing roads, such as Route 2 and Route 2A for the automobile in the 1920s and 1930s and also the creation of Route 128/I-95 regional highway in the 1950s, supported local growth. This suburbanization trend continues today around the park. Within the park, as part of its mission to preserve and interpret individual resources that contribute to understanding the site's historical events, the NPS removed approximately 200 structures and nearly 100 percent of commercial development. These reclaimed open spaces provide a backdrop for the remaining historical resources.

10.9.4 Historic and Archaeological Resources in MMNHP

Included in the MMNHP boundaries are numerous historic buildings, structures, sites, and landscapes. Many of the key historic resources and areas within the park are shown on Figures 10-5 and 10-6 and are summarized in Table 10-13. The NPS completed a comprehensive

inventory of all resources in MMNHP as part of an updated National Register nomination.¹⁶⁶ The NPS inventory identified approximately 106 resources that contribute to the historic significance of the park, as well as 24 resources that do not contribute, primarily due to their recent age. The complete NPS inventory for the park is included in Appendix G. The NPS is in the process of updating the MMNHP National Register resource list and documentation.

Extant historic farming fields in the park are dominantly clustered at the west end of the Battle Road Unit between the Farwell Jones and the Olive Stow houses and Meriam's Corner in Concord. Smaller fields also remain at the Trainor field and Fiske Hill fields in Lexington, and at fields near Bloody Angle and the Hartwell Tavern in Lincoln. An archaeological overview and assesment of MMNHP, with emphasis on the Battle Road Unit, was completed in 2005.¹⁶⁷ This study reports that MMNHP contains documented archaeological resources that date from approximately 9,000 years before present to the early twentieth century. More than 100 prehistoric and historic period archaeological sites have been identified within the park, and there is a high probability of additional sites being present in most areas.

10.10 MMNHP General Management Plan

The 1989 General Management Plan (GMP) for MMNHP has largely been implemented. In 2012 and in 2017, the NPS was in an ongoing planning process to develop a new General Management Plan (GMP) to replace the existing 1989 GMP. Several projects have been completed in the park since the 2012 *ESPR*.

Table 10-13 Key Resources in the Minute Man National Historical Park

Town	MHC #	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status ¹
BATTLE ROAD UNIT						
Concord, Lexington, Lincoln	N/A2	Multiple	Along and off Massachusetts Avenue and Lexington Road	Battle Road	18th-20th centuries	Contributing
Concord, Lexington, Lincoln	N/A	Multiple	Off Massachusetts Avenue and Lexington Road	Battle Road Trail	1996-2001	Non-Contributing
Concord	N/A	MM-10	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing

¹⁶⁶ Harrington et al. (PAL), Minute Man National Historical Park National Register of Historic Places Documentation, Concord, Lexington, and Lincoln, Massachusetts, 2001. The National Park Service is currently updating this documentation.

¹⁶⁷ Herbster (PAL), Archeological Overview and Assessment, Minute Man National Historical Park, Concord, Lexington, and Lincoln, Massachusetts, 2005.

Town	MHC #	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status ¹
Concord	CON.9015	MM-8	Old Bedford Road	Meriam's Corner Monument	1885	Contributing
Concord	CON.350	MM-9	34 Old Bedford Road	Meriam House	ca. 1705, ca. 1725	Contributing
Concord	CON.357	MM-11	965 Lexington Road	Olive Stow House /Farwell Jones House /Carty Barn	Colonial - ca. 1760	Contributing
Concord	CON.358	MM-12	1175 Lexington Road	Samuel Brooks House	ca. 1692-1728	Contributing
Lexington	LEX.929	MM-28	Old Massachusetts Avenue and Wood Street	Bluff Monument	1885	Contributing
Lexington	N/A	MM-30	Old Massachusetts Avenue and Wood Street	Ebenezer Fiske House Foundation	ca. 1729-late 19th century	Contributing
Lexington	N/A	MM-29	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Lexington	LEX.618 LEX.1536	MM-27	21 Marrett Street	Jacob Whittemore House /John Muzzey House and Hargrove /Whittemore Barn	Georgian- 1745 (Barn-1850)	Contributing
Lexington	N/A	MM-26	Massachusetts Avenue	Minute Man Visitors Center	Modern- 1976	Non-Contributing
Lexington	N/A	MM-25	Off Massachusetts Avenue, Fiske Hill and Concord Hill	Parkers Revenge	1775	Contributing
Lincoln	N/A	MM-16	Off Lexington Road	Bloody Angle	1775	Contributing
Lincoln	LIN.70	MM-19	Virginia Road	Captain William Smith House	Colonial-ca. 1750	Contributing
Lincoln	LIN.66	MM-17	Virginia Road	Ephraim Hartwell Tavern	Colonial-1733	Contributing
Lincoln	N/A	MM-21	Off Route 2A	Historic Farming Fields	18th-20th centuries	Contributing
Lincoln	N/A	MM-14	North Great Road	Job Brooks House	Colonial-1740	Contributing

Town	MHC #	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status ¹
Lincoln	LIN.170 LIN.171	MM-22	200 Massachusetts Avenue	John Nelson House and Barn	Federal-1808, 1810	Contributing
Lincoln	LIN.65	MM-15	37 North Great Road	Joshua Brooks, Jr. House	Federal-1780	Contributing
Lincoln	LIN.929	MM-23	Nelson Road	Josiah Nelson, Jr. House Foundation	ca. 1775	Contributing
Lincoln	LIN.64	MM-13	33 North Great Road	Noah Brooks Tavern (and Carriage House)	Federal- ca. 1798	Contributing
Lincoln	LIN.940	MM-20	Massachusetts Avenue	Paul Revere Capture Site and Marker	pre 1902	Contributing
Lincoln	LIN.69	MM-18	Virginia Road	Sgt. Samuel Hartwell House Site	1693-1716; burned 1968; shelter 1986	Contributing
Lincoln	LIN.941	MM-24	Nelson Road	Thomas Nelson, Jr. House Foundation	1700-1750	Contributing
NORTH BRIDGE UNIT						
Concord	CON.343	MM-1	231 Liberty Street	Major John Buttrick House	ca. 1715; 19th century alterations	Contributing
Concord	CON.941	MM-4	Liberty Street	The Minuteman (Statue)	1875	Contributing
Concord	CON.940	MM-5	Monument Street	North Bridge	1956	Contributing
Concord	N/A	MM-3	Monument Street	North Bridge Comfort Station	No Style-1984	Non-Contributing
Concord	CON.347	MM-6	269 Monument Street	Old Manse 3	Colonial-1769-1770	Contributing

Town	MHC #	2005 Noise Label	Street Address	Name	Style-Date	NR/SR Status ¹
Concord	CON.344	MM-2	174 Liberty Street	Steadman Buttrick House (NPS Headquarters and Visitor Center)	Colonial Revival-1911	Contributing
WAYSIDE UNIT						
Concord	CON.171	MM-7	455 Lexington Road	The Wayside 3 (Samuel Whitney House)	Colonial/Victorian Eclectic-1716-17; altered mid-1840s; 1860/70	Contributing
BARRETT FARM UNIT						
Concord	CON.256	--	448 Barrett's Mill Road	Col. James Barrett Farm	Colonial-1705	Contributing
Notes: 1. NR – National Register of Historic Places; SR – State Register of Historic Places. 2. N/A – Not Applicable 3. Old Manse and The Wayside are individually listed National Historic Landmarks that are also located within MMNHP.						

The NPS has indicated to Massport for the 2017 *ESPR* that annual visitations at MMNHP are slightly increasing with current levels of about 1.1 – 1.2 million, up from 1.0 million people since the 2012 *ESPR*. Little, if any, expansion of park boundaries or buildings is planned. Individual programs at various sites within the park continue to be advertised to attract audiences, but short-term general promotions to encourage large increases in total attendance are not part of the current or future management plans. The NPS is starting to plan for the 250th anniversary of MMNHP in 2025, including programming for the Barrett Farm Unit to open it to the public.

10.10.1 MMNHP Soundscape

The NPS issued Director's Order 47 (DO47) "Soundscape Preservation and Noise Management" in December 2000. This was the NPS headquarters generic modeling document that would provide a nationwide approach to identifying desired noise criteria in national parks. Park Managers would use the guidance in developing their own Soundscape Management Plans, each tailored to the unique activities, land uses and environmental needs of their individual parks.

Nationally, the NPS explored the issue of aircraft overflights in the 1994 Report on Effects of Aircraft Overflights on the National Park System, which recommended the continuation of the federal interagency working group.. Sound monitoring was conducted in 2008-09 at MMNHP by the NPS Natural Sounds Division with volunteer staff assisting, and is included in the internal

draft plan. The NPS indicated that an internal final draft of the Acoustic Management Environmental Assessment report was completed in 2014, and held public review meetings. Development of the soundscape plan is ongoing. Thirty-one locations within MMNHP were evaluated as noise analysis locations for the 2017 *ESPR*. The analysis of 2017 conditions indicates that noise exposure levels created by aircraft flying over MMNHP ranged from 45 dB to 55 dB. The highest level (55.0 dB) occurred at the Noah Brooks Tavern (and Carriage House) (MM-13); this location had a 51.4 dB level in 2012. No areas of the MMNHP were within the 65 dB DNL contour in 2005, 2012 or 2017.

Approximately 55 acres of the MMNHP were within the 55 dB DNL contour in 2017 as compared to no areas in 2012. TA65 values ranged from 1 to 10.5 minutes at the 31 noise analysis locations, with the highest levels occurring at Samuel Brooks House (MM-12), the Noah Brooks Tavern (and Carriage House) (MM-13), and the Job Brooks House (MM-14). In 2012, the Noah Brooks Tavern (and Carriage House) (MM-13), and the Job Brooks House (MM-14), and Bloody Angle (MM-16) had the highest TA65 values. TA55 values ranged from 18 to 65 minutes, with the highest levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels.

10.11 Environmental Effects in MMNHP

One site in MMNHP experienced a DNL of 55 dB in 2017 due to higher than typical use of Runway 5/23 during a closure of Runway 11/29 for repaving. This was a unique, construction-phase change; none of the sites in the MMNHP would be expected to experience a DNL greater than 55 dB for 2017 or any future scenario in 2025 or 2035.

No portion of MMNHP is located in the 65 DNL contour in 2017 or in the 2025 and 2035 planning scenarios. Under current 2017 conditions, approximately 55 acres of MMNHP are within the 55 DNL noise contour, and the planning scenarios forecast that will be reduced to 30 acres in the 2025 and 26 acres in the the 2035 (see Table 10-1). The 55 DNL noise contour for 2017 is significantly larger in the south central area when compared to the 2012 conditions (see Figure 7-15). The noise contour only overlaps a very small area of the Massport property that falls within the MMNHP Congressional boundary.

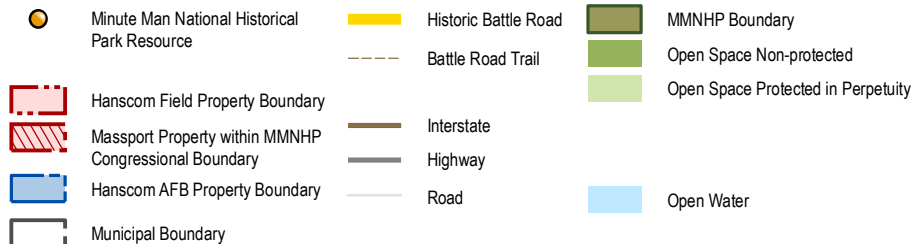
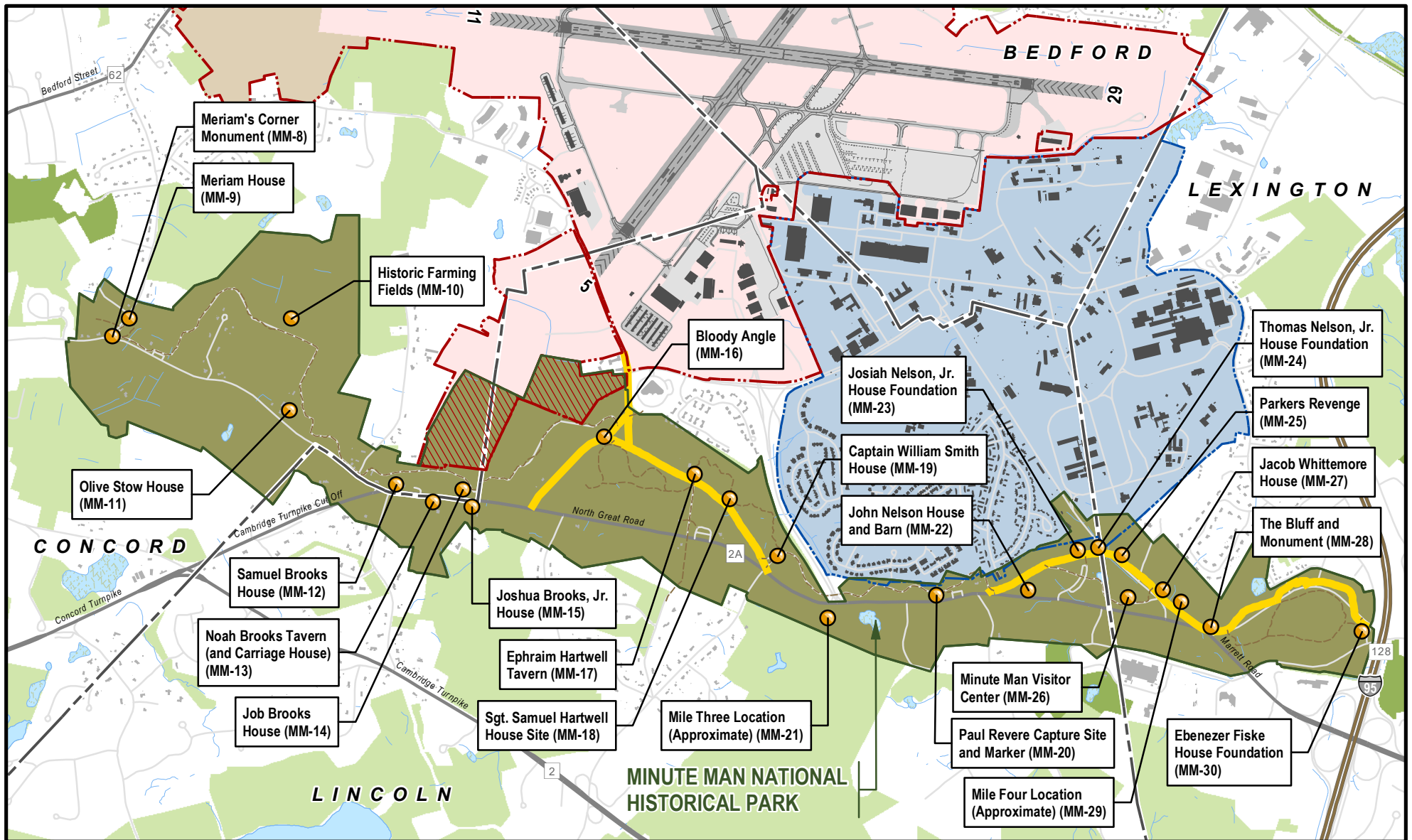
In 2017, Hanscom Field traffic represented approximately two percent of the peak hour traffic on Route 2A. Only one of the studied intersections in the MMNHP (Route 2A/Hanscom Drive) meets the threshold for 10 percent or more of the traffic movements associated with Hanscom Field.

As described in Chapter 8, all air pollutant concentrations are safely in compliance with health-based air quality standards. Therefore, this analysis concluded that no adverse air quality effects to historic resources including MMNHP are anticipated now or in future analysis years from activities at Hanscom Field.

10.11.1 Battle Road (Interpretive) Trail

The Battle Road Trail is an interpretive, multi-use trail within MMNHP that provides cycling, walking, and wheelchair access to the MMNHP's historical and natural resource areas. The route of the Battle Road Trail is shown on Figure 10-5 and Figure 10-6. The stone-dust trail extends five and one-half miles from Fiske Hill in Lexington, through Lincoln, to Meriam's Corner in Concord. The trail contains 25-foot wide portions of the historic Battle Road from April 19, 1775 that are restored and linked together by seven-foot wide sections of trail that traverse landscapes that evoke the past. Other portions of the historic Battle Road Trail follow the route of today's Route 2A.

The DNL, TA65 and TA55 values at noise analysis locations along the Battle Road Trail were plotted in Figures 10-7 through 10-9. None of the Battle Road Trail fell within either the 65 DNL or 55 DNL contours for 2017. Figures 10-7 through 10-9 indicate that DNL and Time Above values are highest to the west of the Hartwell Tavern, reflecting the proximity of this area to runways at Hanscom Field. It should be noted that a visitor to the Battle Road portion of the park is also affected by the background noise of road traffic from Route 128/I-95 and Route 2A throughout most of the day, and that Hanscom Field-related vehicular traffic contributes approximately two percent to the traffic volumes on Route 2A.



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

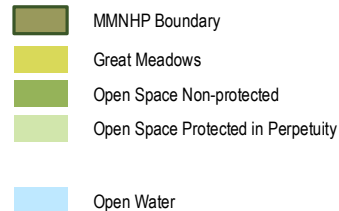
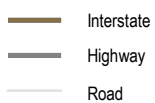
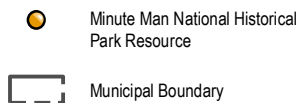
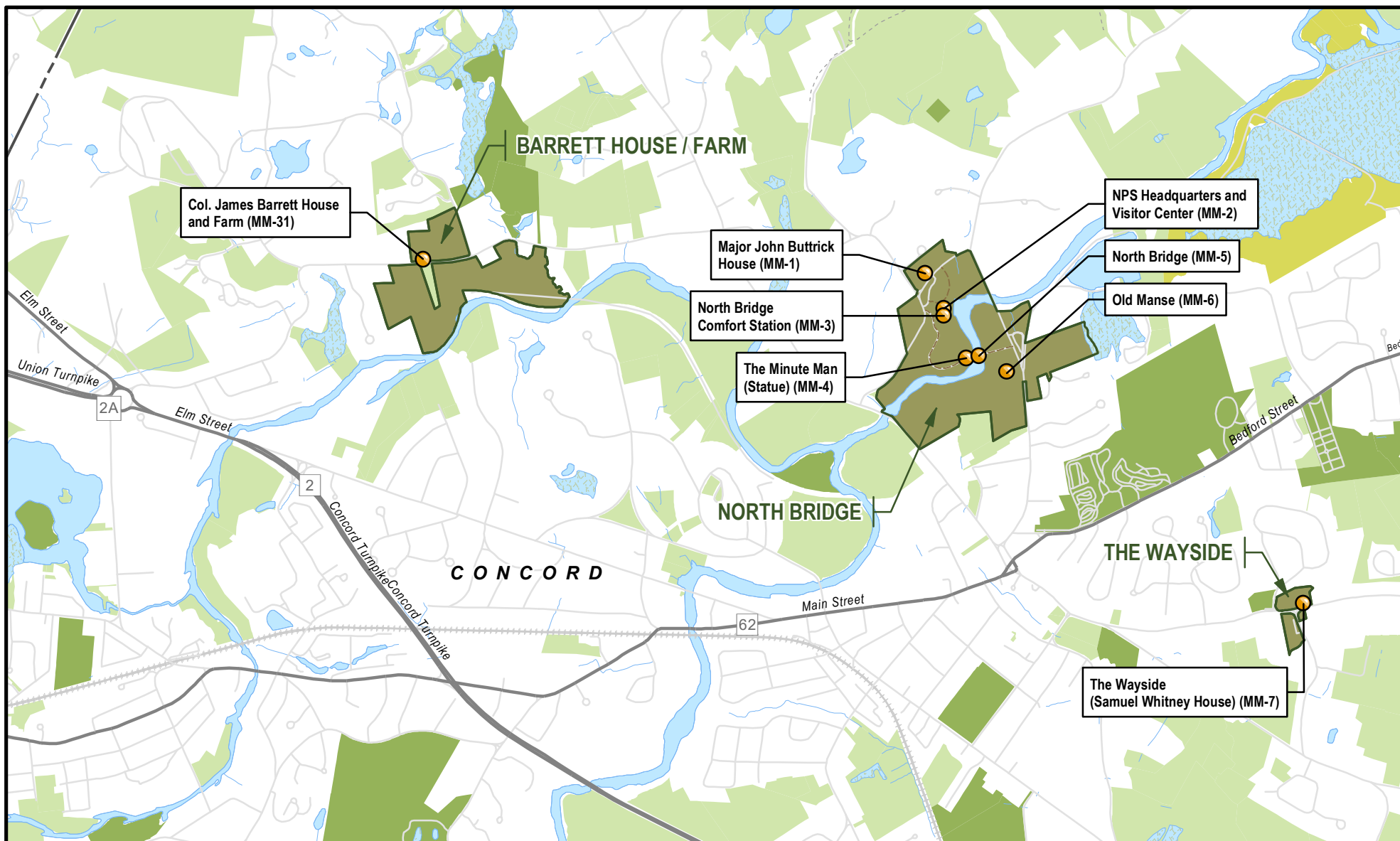


L. G. Hanscom Field

2017 Environmental Status & Planning Report

**Historic Resources
MMNHP Battle Road Unit**

Figure 10-5



L. G. Hanscom Field

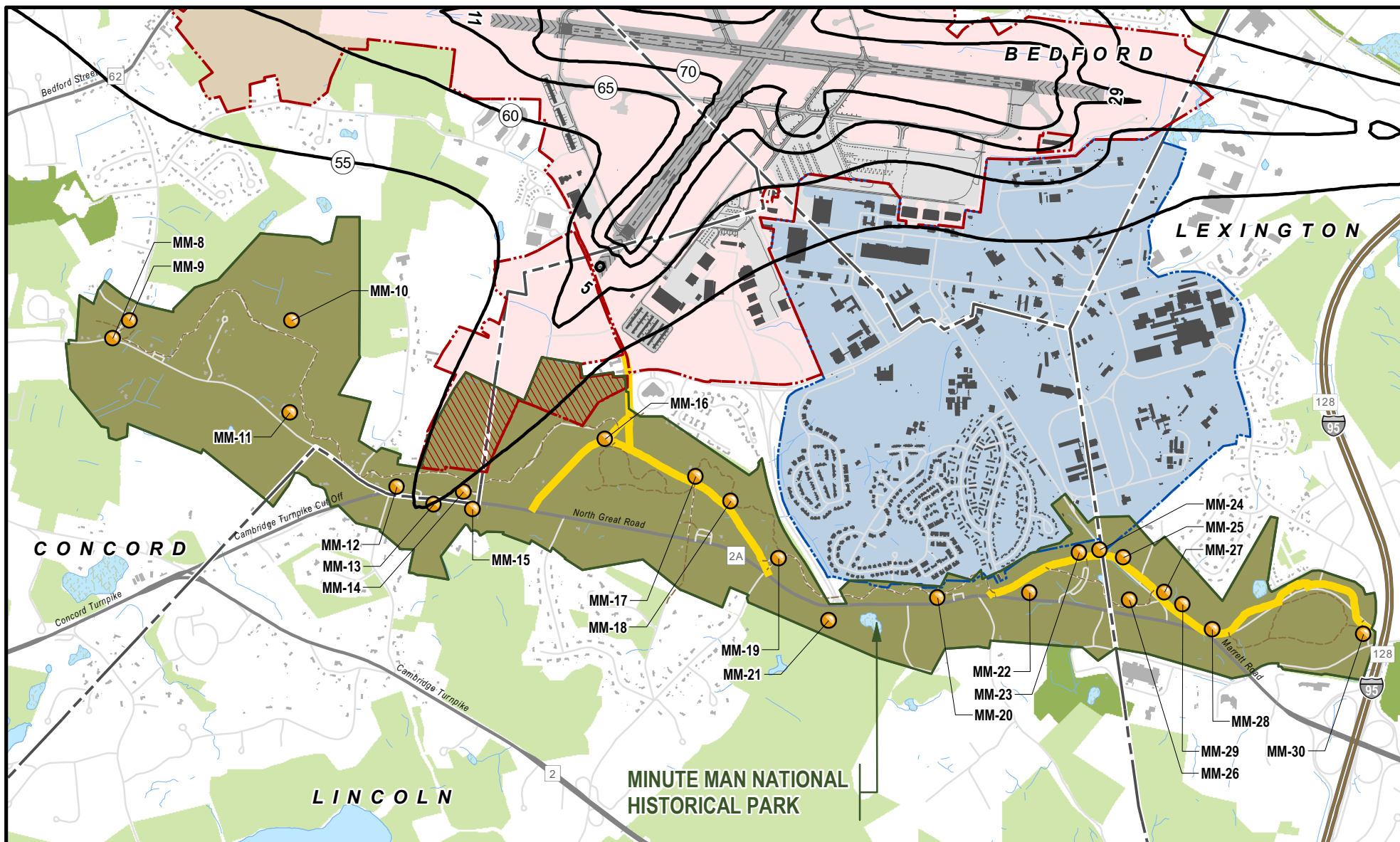
2017 Environmental Status & Planning Report

Historic Resources

MMNHP North Bridge and Barrett Farm

Figure 10-6

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018



- | | | | | | |
|--|---|--|----------------------|--|------------------------------------|
| | 2017 DNL Noise Contour | | Historic Battle Road | | MMNHP Boundary |
| | Minute Man National Historical Park Resource | | Battle Road Trail | | Open Space Non-protected |
| | Hanscom Field Property Boundary | | Interstate | | Open Space Protected in Perpetuity |
| | Massport Property within MMNHP Congressional Boundary | | Highway | | Open Water |
| | Hanscom AFB Property Boundary | | Road | | |
| | Municipal Boundary | | | | |



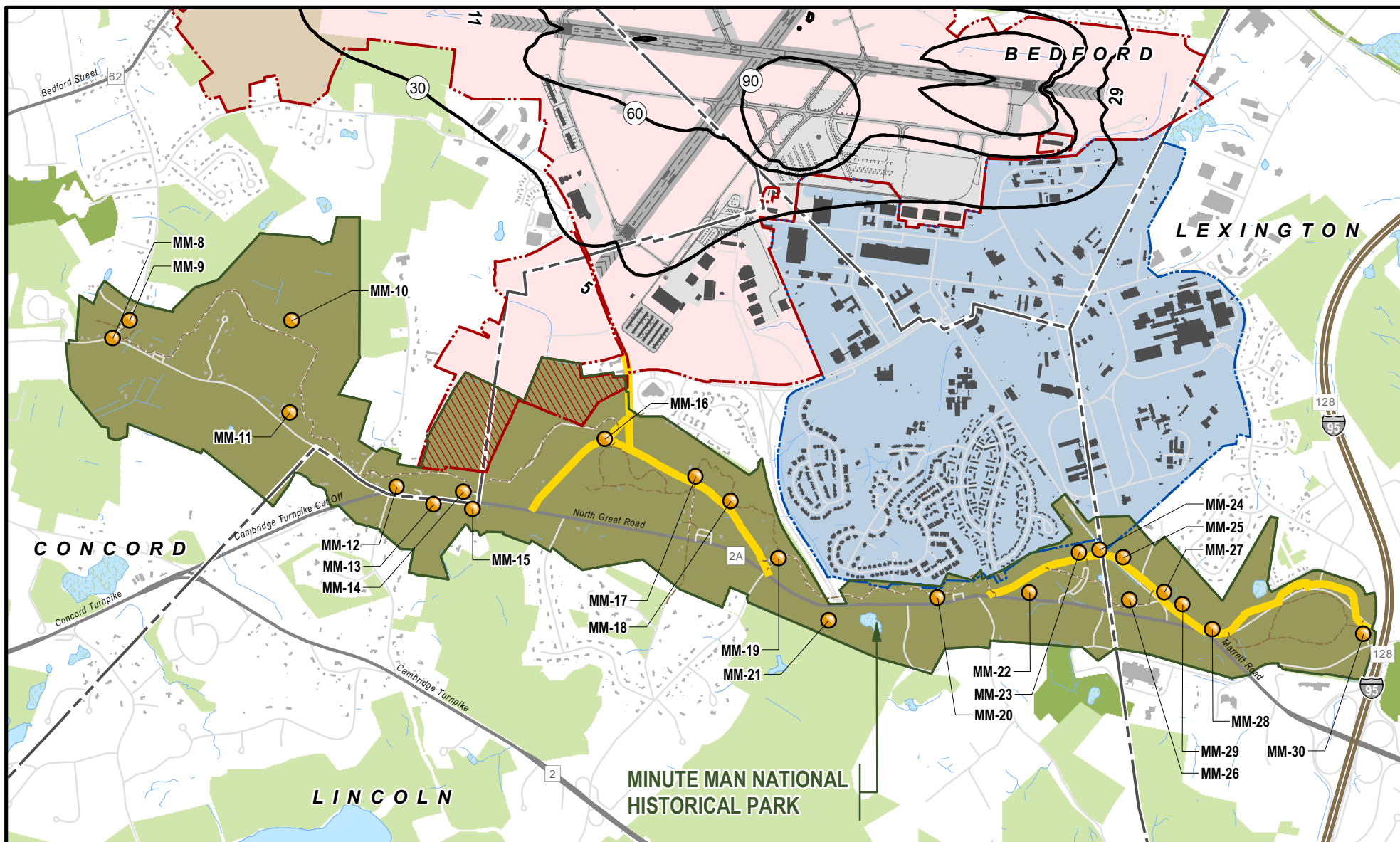
L. G. Hanscom Field

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2017 DNL at MMNHP Battle Road Unit

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

Figure 10-7



- | | | | | | |
|--|---|--|----------------------|--|------------------------------------|
| | 2017 Time Above 65 dBA Contours (Minutes) | | Historic Battle Road | | MMNHP Boundary |
| | Minute Man National Historical Park Resource | | Battle Road Trail | | Open Space Non-protected |
| | Hanscom Field Property Boundary | | Interstate | | Open Space Protected in Perpetuity |
| | Massport Property within MMNHP Congressional Boundary | | Highway | | |
| | Hanscom AFB Property Boundary | | Road | | Open Water |
| | Municipal Boundary | | | | |



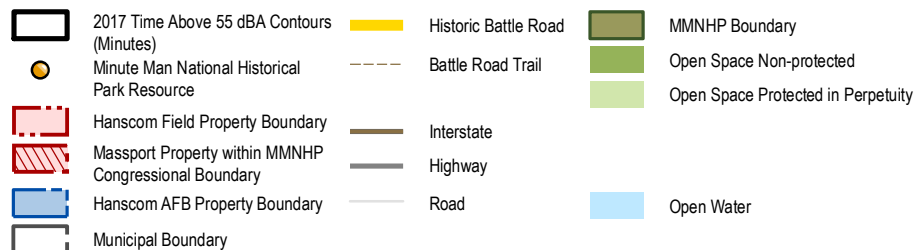
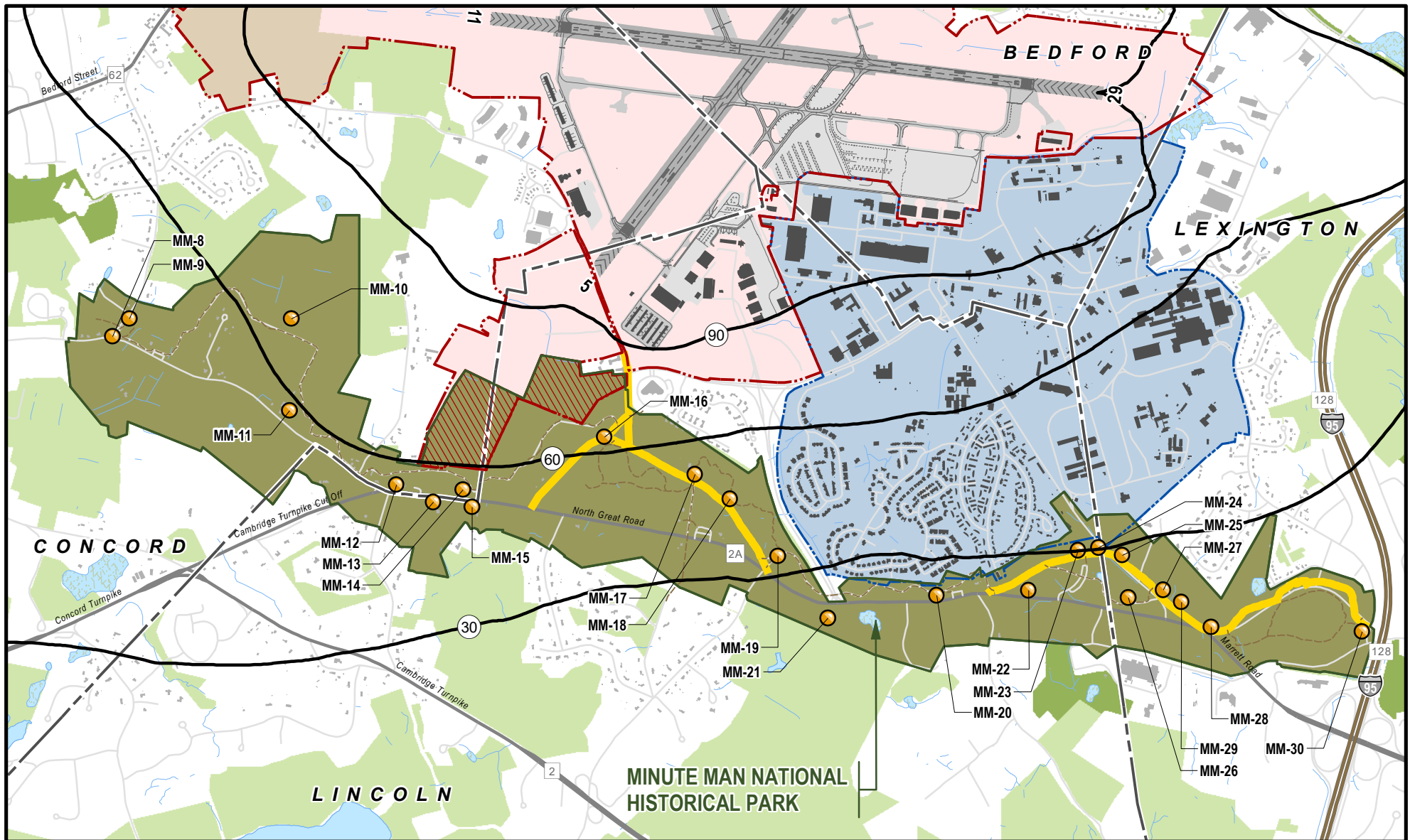
L. G. Hanscom Field

2017 Environmental Status & Planning Report

2017 Time Above 65 dBA at MMNHP Battle Road Unit

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

Figure 10-8



L. G. Hanscom Field

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2017 Time Above 55 dBA at MMNHP Battle Road Unit

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

Figure 10-9

10.11.2 MMNHP Current Status and Future Concerns

At the July 2018 coordination meeting for the 2017 *ESPR*, the MMNHP Superintendent indicated ongoing concerns regarding how noise from aircraft affects park programming. NPS is particularly concerned about noise levels at North Bridge, including at locations outside the 55 DNL contour, such as Parker's Revenge (noise receptor MM-25). The Park noted the site is more open than it was during the preparation of the 2012 *ESPR*. Noise studies in Chapter 7 show the site has decreased in noise from 47.0 dB in 2012 to 46.8 db in 2017. The Park staff have also noted a perceived increase in air traffic.

Massport's Fly Friendly program was instituted in 2009. The program aims to decrease noise over Hartwell Tavern, where Park leaders indicated to Massport that a large number of interpretive talks are held. The program vigorously promotes fly friendly techniques as well as voluntary measures for pilots to avoid Hartwell Tavern (noise receptor MM-17) while performing touch and go training operations. Since the inception of the program in 2009, air traffic over Hartwell Tavern has decreased by 22%. Further discussion of noise levels at MMNHP locations is detailed in Chapter 7.

10.12 Analysis of Future Scenarios

This section analyzes the potential effects of the 2025 and 2035 scenarios on cultural and historical resources within and in the vicinity of Hanscom Field. The environmental analysis focuses on noise and traffic effects of the 2025 and 2035 planning scenarios. The air quality assessment, discussed in Chapter 8, concludes that even maximum air concentrations for the 2025 and 2035 scenarios comply with all health-based air quality standards and therefore will result in no adverse air quality effects to historic resources including MMNHP.

The analyses of cultural and historical resources use information on future aviation operations activity levels presented in Chapter 3 Airport Activity Levels, and potential new facilities described in Chapter 4 Airport Planning. Data is also derived from the evaluation of traffic volumes and intersection operations that are described in Chapter 6 Ground Transportation, and noise analyses for DNL and TA measurements that are presented in Chapter 7.

Any future project at Hanscom Field will undergo a project-specific environmental review process in the event that MEPA, NEPA, or other applicable environmental review thresholds are met. The historic resources and archaeological reconnaissance surveys (included in Appendix G), will provide baseline data for these assessments. Additional cultural and historical properties may be identified through more detailed surveys in that process and will be addressed at that time.

As described in Chapter 6 Ground Transportation, the 2017 *ESPR* reflects Massport's commitment to traffic management approaches to address future Hanscom Field-related

traffic volumes, rather than physical modifications to intersections to add capacity. The traffic analysis focuses on predicted traffic volume changes on Route 2A in the MMNHP.

As stated in Chapter 7, any significant changes in noise exposure are assessed based on both the absolute value of the projected DNL, as well as the magnitude of the change. Noise analysis considers as significant changes in DNL on the order of 1.5 dB or more for areas within the 65 dB DNL noise contour and changes of 3.0 or more decibels between 60 and 65 dB DNL.¹⁶⁸ Noise impact criteria are used to determine areas for further analysis and possible mitigation when completing environmental documentation for a specific project at an airport. Though the 2017 *ESPR* is not an environmental permitting document for a project, the use of these criteria help to highlight notable changes in the noise environment at Hanscom Field.

Chapter 7 presents 2025 and 2035 noise exposure levels at noise analysis locations including those that are cultural and historic resources. The 65 dB DNL noise contour was used as a guideline for determining potential land use incompatibilities, in accordance with FAA guidelines. The Secretary directed Massport to evaluate the extent of the 55 dB DNL noise contour in the 2017 *ESPR*.

10.13 Future Scenarios: Historic Resources

This section assesses potential effects to historic resources that could result from the 2025 and 2035 future planning scenarios. Assessment of future noise effects to historic resources focuses on the National and State Registers-listed properties and the MHC Inventory and MACRIS-listed resources. The noise analysis, as presented in Chapter 7, includes 24-hour noise and time above exposure values. Information about the environmental effects to MMNHP is contained in a separate section below.

10.13.1 National and State Registers Properties

Figures 10-10 and 10-11 illustrate the location of historic National and State Registers properties in the vicinity of Hanscom Field generally, and the MMNHP Battle Road Unit specifically, relative to the noise contours for the 2025 and 2035 growth scenarios. The figure includes the contours for 2012 and 2017 as well for comparing future noise forecasts with that experienced in recent years. Table 10-14 presents DNL values for the 2025 and 2035 scenarios at the 12 locations with the highest DNL values in 2017. No historic properties fall within the 65 dB DNL noise contour or experience increased exposure of 3.0 dB or more at DNL levels between 60 and 65 dB. As compared to the 2012 DNL values, the increases in DNL values for

¹⁶⁸ U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Environmental Impacts: Policies and Procedures, FAA order 1050.1E CHG1, Washington, DC.

most National and State Registers sites are less than one decibel and they have DNL values below 55 dB in the 2025 and 2035 scenarios.

Table 10-14 DNL Values for Historic Architectural Properties Listed in the National and State Registers of Historic Places

MHC #	Name ¹	Street Address	Town	Noise Label	2005	2012	2017	2025	2035
CON.177	Deacon John Wheeler-Captain Jonas Minot Farmhouse (aka Thoreau Birthplace)	341 Virginia Rd.	Concord	NC-18	60.4	58.4	57.8	58.6	59.0
CON.178	Wheeler-Meriam House	477 Virginia Rd.	Concord	NC-19	59.9	58.1	57.7	58.4	58.8
LEX.413	Simonds Tavern	331 Bedford St.	Lexington	NLX-1	55.5	53.0	54.5	55.3	55.9
BED.V	Bedford Depot Park Historic District	80 Loomis St. and 120 South Rd.	Bedford	NB-5	53.7	49.8	52.0	51.6	52.1
CON.170	Orchard House	399 Lexington Rd.	Concord	NC-17	53.8	50.2	50.0	50.8	51.3
CON.317	Ralph Waldo Emerson House	28 Cambridge Tpk.	Concord	NC-15	52.9	49.1	49.1	49.9	50.4
CON.802 (CON.DY)	Sleepy Hollow Cemetery	24 Court Ln.	Concord	NC-12	52.2	49.0	49.0	49.9	50.4
CON.DS	American Mile Historic District	Lexington Road	Concord	NC-13	51.7	48.5	48.6	49.5	49.9
CON.329	Wright Tavern	Lexington Rd. & Main St.	Concord	NC-11	51.0	48.2	48.4	49.2	49.6
CON.DV	North Bridge-Monument Square Historic District	Monument St., Liberty St., and Lowell St.	Concord	NC-10	50.5	48.2	48.4	49.2	49.6
CON.A	Concord Monument Square- Lexington Road Historic District	Monument Sq. and Lexington Rd.	Concord	NC-14	50.9	48.1	48.3	49.1	49.6
CON.DU	Main Street Historic District	Main St. between Monument Sq. and Wood St.	Concord	NC-9	50.8	48.0	48.3	49.1	49.5
Notes: 1. The historic districts and properties with the 12 highest DNL values in 2017 are listed in order of their DNL value. 2. MMNHP sites are included in Table 10-17.									

10.13.2 2025 Scenario

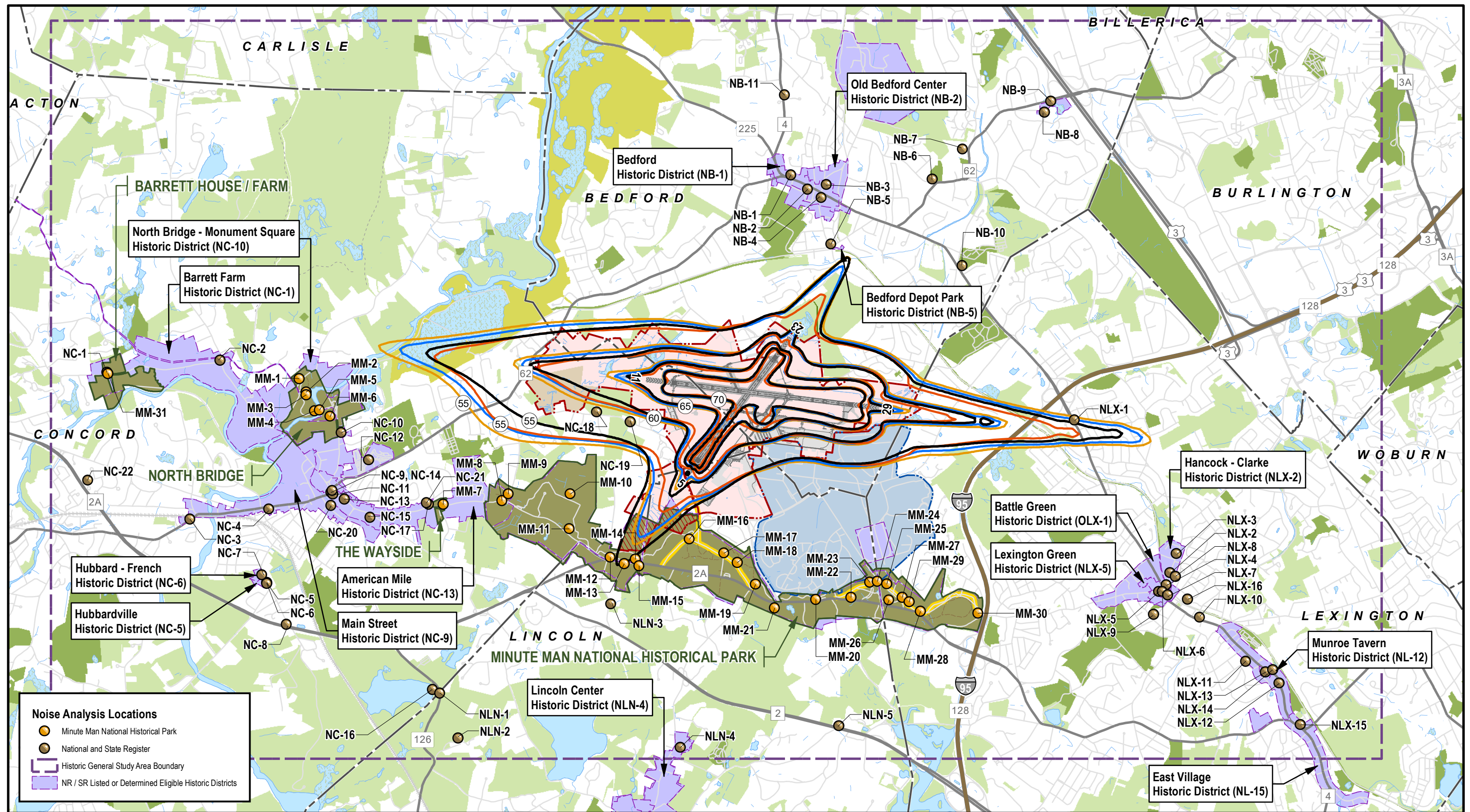
Two historic National Register-listed properties in Concord that are located on Virginia Road next to Hanscom Field would have DNL values between 55 and 60 dB DNL in the 2025 scenarios see Figure 10-10):

- ⇒ Deacon John Wheeler/Capt. Joseph Minot Farmhouse (NC-18) in Concord is forecast at 58.6 dBA in the 2025 scenario (compared to 57.8 dBA in 2017); and
- ⇒ Wheeler-Meriam House (NC-19) in Concord is forecast at 58.4 dBA in the 2025 scenario (compared to 57.7 dBA in 2017).

The next highest predicted level for a historic National Register-listed resource, Simonds Tavern (NLX-1) in Lexington, would have a DNL value of 55.3 dBA in the 2025 scenario (compared to 54.5 dBA in 2017). All other sites would have a DNL value below 55 dBA in both the 2025 and 2035 scenarios. The highest predicted TA65 level occurs at the Wheeler-Meriam House for the 2025 scenario, which increases from 27.6 minutes a day in 2017 to 31.3 minutes a day minutes a day in the 2025 scenario (see Figure 10-12).

The highest 2025 TA55 level also occurs at Wheeler-Meriam House, which increases from 121.7 minutes a day in 2017 to 128.4 minutes a day in the 2025 scenario (see Figure 10-13). In both the 2017 and 2025 scenarios, the TA65 is lower than in 2012 at this site. Each of the 18 historic districts listed in Table 10-15 is outside the 65 dBA DNL contour for the 2017 existing conditions and the 2025 and 2035 scenarios.

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Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018



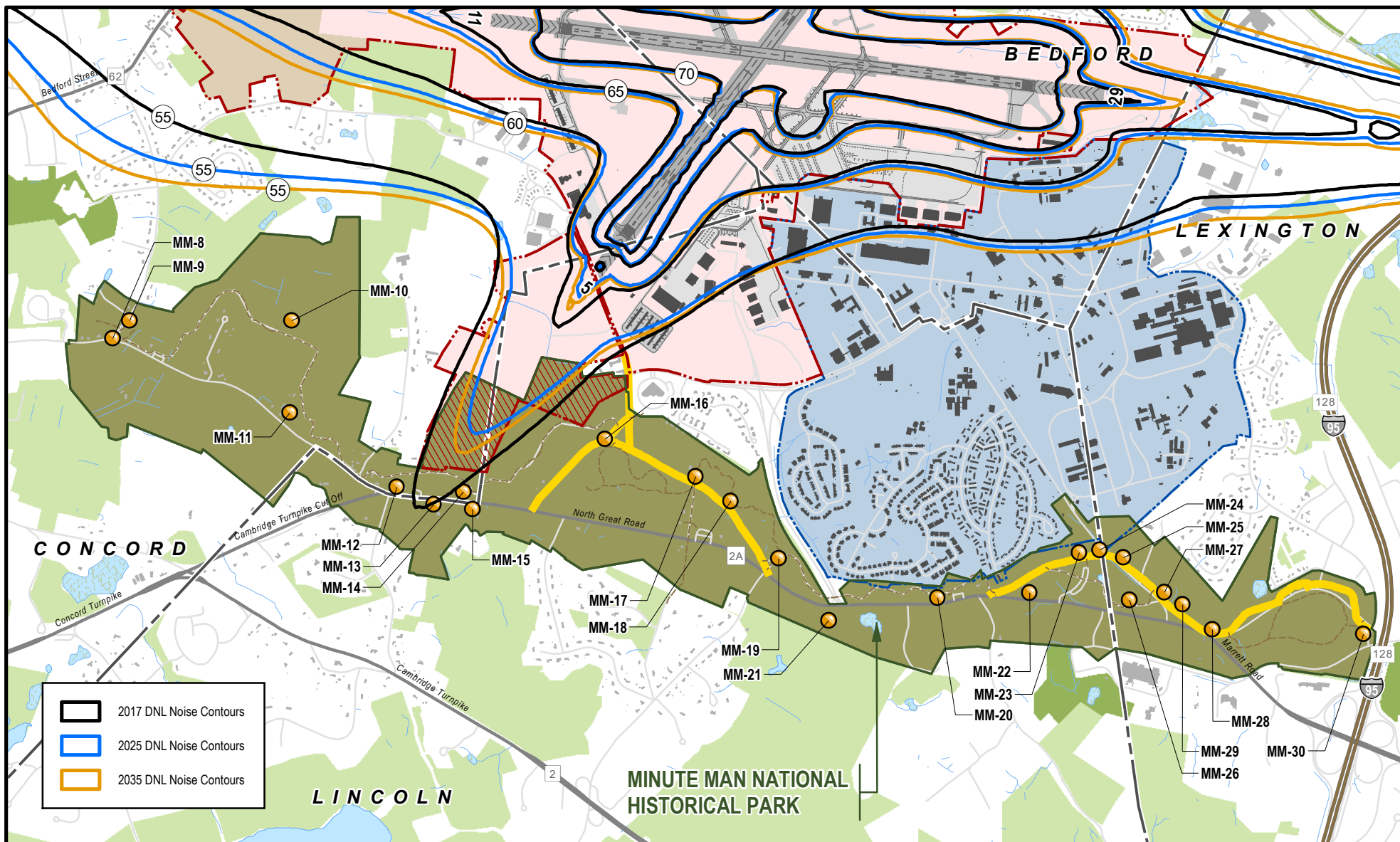
L. G. Hanscom Field

2017 Environmental Status & Planning Report

Historic Resources within the
2012, 2017, 2025 and 2035 DNL
Noise Contours



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Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

- Minute Man National Historical Park Resource
- Hanscom Field Property Boundary
- Massport Property within MNHP Congressional Boundary
- Hanscom AFB Property Boundary
- Municipal Boundary
- Historic Battle Road
- Battle Road Trail
- Interstate
- Highway
- Road
- MNHP Boundary
- Open Space Non-protected
- Open Space Protected in Perpetuity
- Open Water



L. G. Hanscom Field

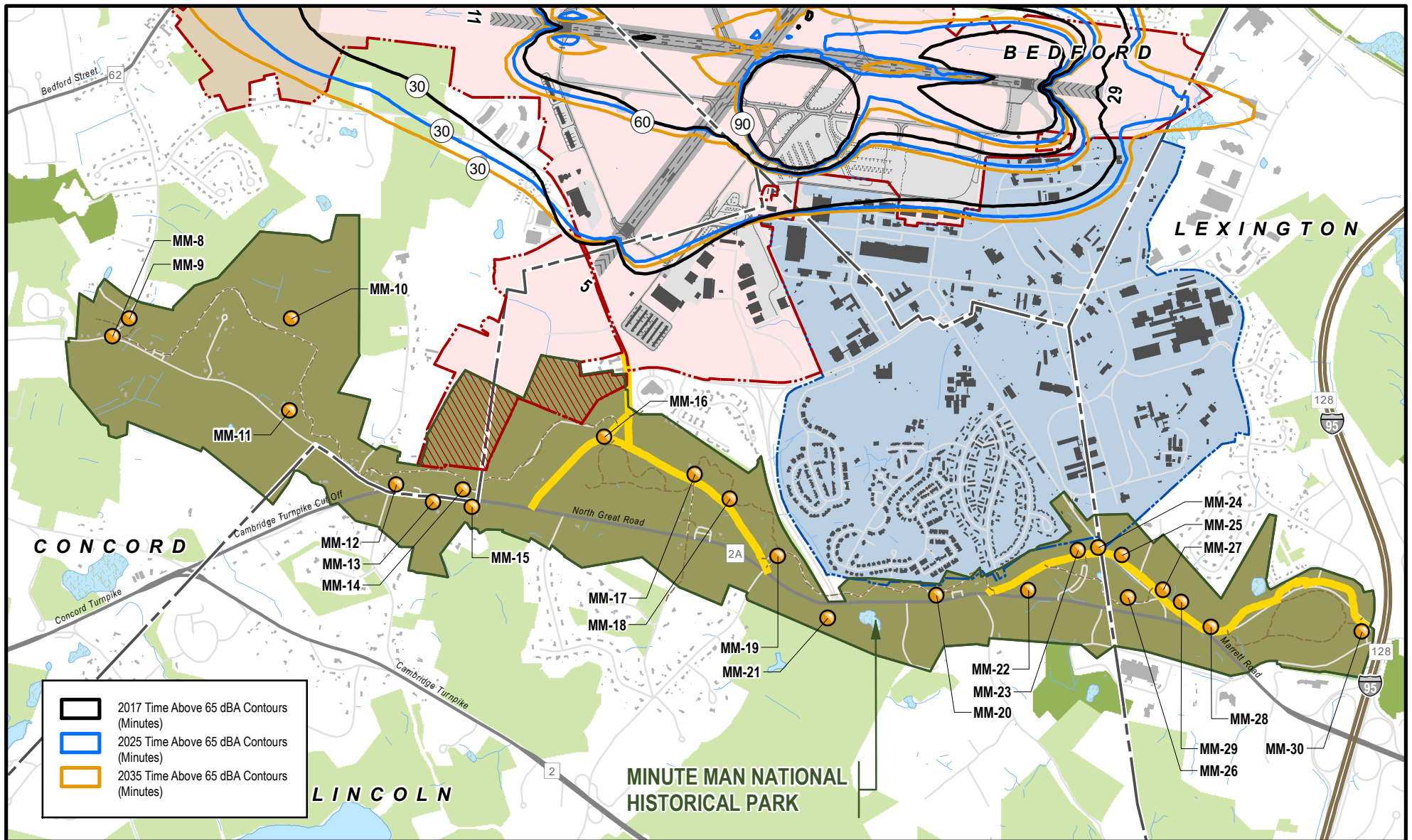
2017 Environmental Status & Planning Report

2017, 2025 and 2035 DNL at
MMNHP Battle Road Unit

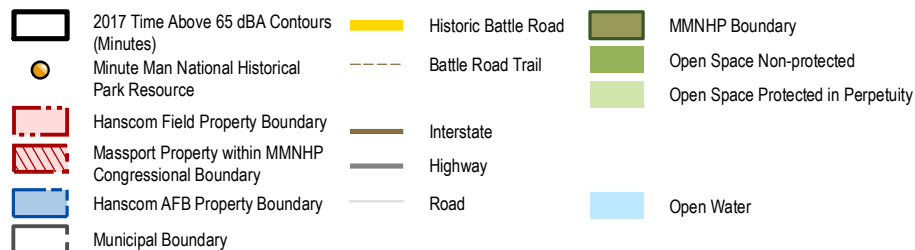
Figure 10-11

Table 10-15 Area of National and State Registers Historic Districts within the 55 dBA DNL Contour

MHC Number	Name ¹	Acreage	2017	2025	2035
BEDFORD					
BED.V	Bedford Depot Park Historic District	6.8 acres	0 acres	0 acres	0 acres
BED.A	Bedford Historic District	42 acres	0 acres	0 acres	0 acres
BED.C	Old Bedford Center Historic District	79 acres	0 acres	0 acres	0 acres
BED.K	Old Burlington Road- Wilson Mill Area	2.7 acres	0 acres	0 acres	0 acres
CONCORD					
CON.DS	American Mile Historic District	133 acres	0 acres	0 acres	0 acres
CON.DT	Barrett Farm Historic District	221 acres	0 acres	0 acres	0 acres
CON.A	Concord Monument Sq.- Lexington Rd Historic District	42 acres	0 acres	0 acres	0 acres
CON.EA	Hubbard-French Historic District	2.6 acres	0 acres	0 acres	0 acres
CON.DZ	Hubbardville Historic District	6.6 acres	0 acres	0 acres	0 acres
CON.DU	Main Street Historic District	74 acres	0 acres	0 acres	0 acres
CON.DV	North Bridge- Monument Square Historic District	89 acres	0 acres	0 acres	0 acres
LEXINGTON					
LEX.B	Battle Green Historic District	110 acres	0 acres	0 acres	0 acres
LEX.E	East Village Historic District	56 acres	0 acres	0 acres	0 acres
LEX.C	Hancock-Clarke Historic District	34 acres	0 acres	0 acres	0 acres
LEX.AC	Lexington Green Historic District	17 acres	0 acres	0 acres	0 acres
LEX.D	Munroe Tavern Historic District	70 acres	0 acres	0 acres	0 acres
LEX.AZ	Richard Gleason Tower Estate	10.3 acres	0 acres	0 acres	0 acres
LINCOLN					
LIN.A LIN.D	Lincoln Center Historic District	187 acres	0 acres	0 acres	0 acres
Note: 1. All districts are outside the 65 dBA DNL contours for 2017 and the 2025 and 2035 scenarios. MMNHP is discussed separately.					



Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

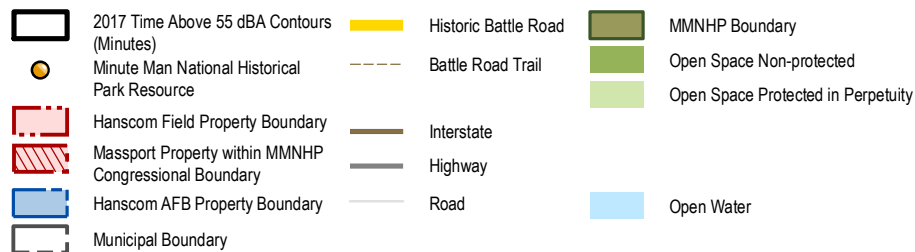
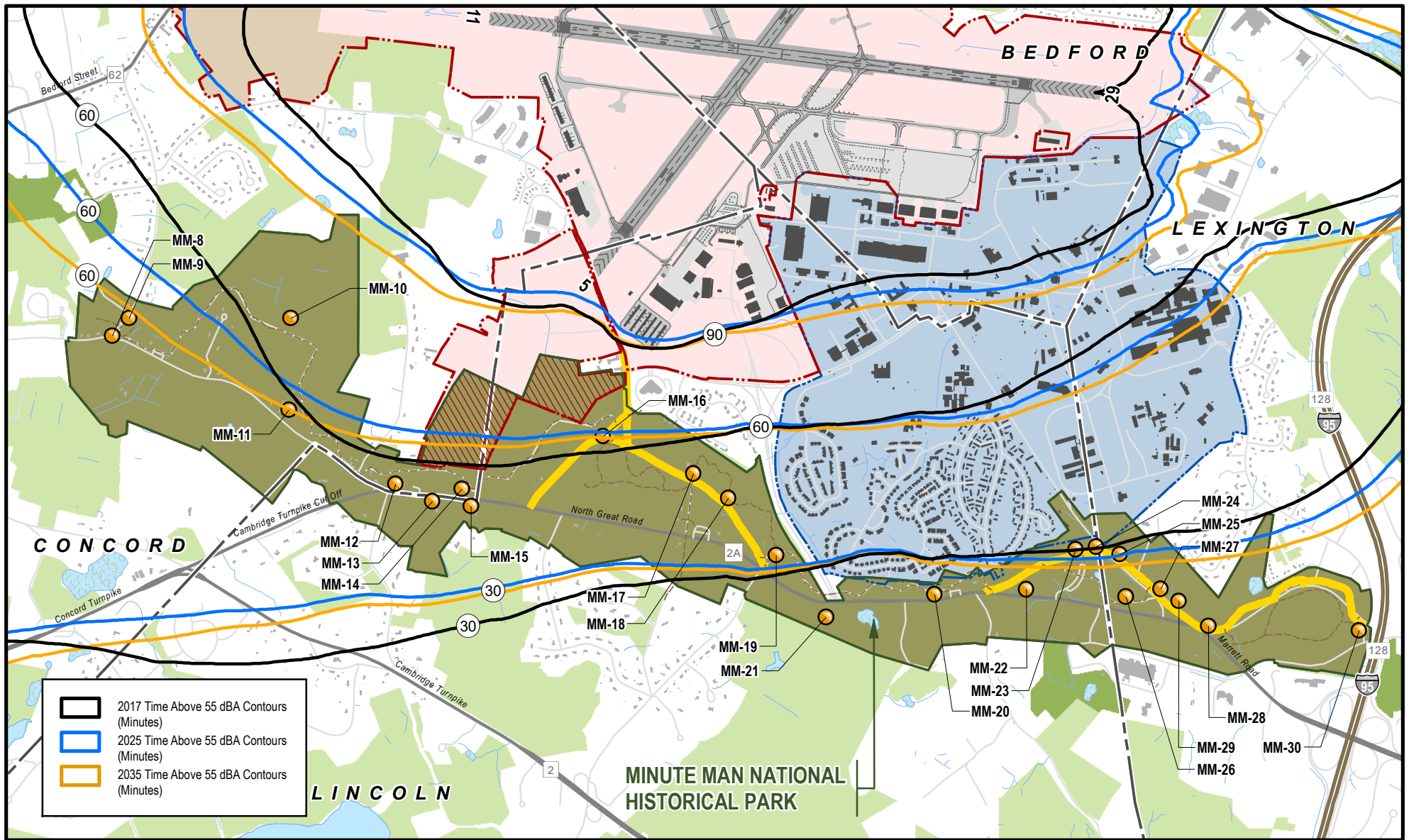


L. G. Hanscom Field

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2017, 2025 and 2035
Time Above 65 dBA at
MMNHP Battle Road Unit

Figure 10-12



L. G. Hanscom Field

2017 Environmental Status & Planning Report

2017, 2025 and 2035
Time Above 55 dBA at
MMNHP Battle Road Unit

Data Sources: Massport (ALP) October 24, 2017; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; PAL, Inc. (Noise Sensitive Receptors), October 5, 2018

10.13.3 2035 Scenario

No historic sites would be exposed to DNL values greater than 65 dB in the 2035 scenario (see Figure 10-11). Increases are projected to be between 0.5 dB and 1.5 dB. Three properties are expected to have noise levels between 55 and 65 dB:

- ⇒ Deacon John Wheeler/Capt. Jonas Minot Farmhouse (NC-18) in Concord is forecast at 59.0 dBA in the 2035 scenario (compared to 57.8 dBA in 2017).
- ⇒ Wheeler-Meriam House (NC-19) in Concord is forecast at 58.8 dBA in the 2035 scenario (compared to 57.7 in 2017).
- ⇒ Simonds Tavern (NLX-1) in Lexington is forecast at 55.9 dBA in the 2035 scenario (compared to 54.5 in 2017).

None of the other properties would experience noise levels that exceed 55 dBA. The highest predicted TA65 level would occur at the Wheeler-Meriam House in the 2035 scenario; the TA65 would increase from 27.6 minutes a day in 2017 to 33.9 minutes a day in 2035 (see Figure 10-12). The highest predicted TA55 would also occur at the Wheeler-Meriam House in the 2035 scenario; the TA65 would increase from 121.7 minutes a day in 2017 to 135.8 minutes a day (see Figure 10-12 and Figure 10-13).

Table 10-16 Historic Resources in the MHC Inventory and MACRIS within the 65 dBA and 55 dBA DNL Contours for the 2025 and 2035 Scenarios

Location ¹	2017 MHC Inventory ²	2017 ³		2025 ³		2035 ³	
		65 dBA	55 dBA	65 dBA	55dBA	65 dBA	55 dBA
AREAS							
Bedford	2	-	2	-	2	-	2
Concord	8	-	6	-	6	-	8
Lexington	2	-	2	-	2	-	2
Lincoln	2	-	-	-	2	-	2
Total	14	0	10	0	12	0	14
INDIVIDUAL PROPERTIES							
Bedford	14	-	12	-	14	-	14
Concord	25	-	15	-	20	-	25
Lexington	137	-	55	-	107	-	137
Lincoln	-	-	-	-	-	-	-
Total	176	0	82	0	141	0	176
Notes:							
1. Based on research for 2017 <i>ESPR</i> .							
2. Appendix G lists these historic resources.							
3. The number of areas listed are fully or partially within the 55 dBA DNL contour.							

10.13.4 MHC Inventory and Information from Historic Commissions

None of the historic resources in the MHC Inventory and MACRIS would be within the 65 dB DNL contour for the 2025 or 2035 scenarios. Table 10-16 summarizes by town the number of historic resources in the MHC Inventory and MACRIS that would be within the 55 dB DNL contour for the 2025 and 2035 scenarios.

- ⇒ 2025 Scenario - In the 2025 growth scenario, 12 survey areas and 141 individual historic resources listed in the MHC Inventory and MACRIS would be within the 55 dB DNL contour.
- ⇒ 2035 Scenario – In the 2035 growth scenario, 14 survey areas and 176 individual historic resources listed in the MHC Inventory and MACRIS would be within the 55 dB DNL contour.

10.14 Future Scenarios: Archaeological Resources

Massport encourages new development in areas with existing impervious surfaces that take advantage of existing infrastructure. Any physical changes proposed near recorded archaeological sites and/or in undisturbed portions of the airport, have the potential to affect archaeological resources. These areas would be studied, as appropriate, if a project were proposed that affected a relevant area. Ground disturbance is not contemplated near traffic study intersections, since no physical modifications are proposed by Massport for these locations. The following is an assessment of the potential impacts from possible development to archaeological resources and/or sensitivity areas from the planning areas reviewed for 2025 and 2035 and described in Chapter 4. The five planning areas are the North Airfield, Northeast Airfield, East Ramp, West Ramp and Pine Hill. The impacts assessment is based on the information in the archaeological reconnaissance survey update for the *2017 ESPR*.

10.14.1 2025 Scenario

Development in the 2025 scenario is evaluated for four of the five planning areas described in Chapter 4. No development is considered in the 2025 scenario for the Northeast Airfield parcel. All development evaluated for the East Ramp will occur on existing impervious ramp and apron and are entirely within areas assessed as having a low archaeological sensitivity. These potential development sites are unlikely to affect potentially significant archaeological resources.

New development is also evaluated for some areas of the North Airfield and Pine Hill planning areas. The sites in these two areas are entirely within areas assessed as having a low archaeological sensitivity, and they are unlikely to affect potentially significant archaeological resources.

New development evaluated for the West Ramp planning area includes three possible areas of development. Two are located in low sensitivity areas, but one small area in the southeastern section is within an area of moderate/high archaeological sensitivity.

While the majority of the new development concepts for the 2025 scenario would be sited on existing impervious and previously disturbed areas, one potential West Ramp development area is located within an area that is presently vegetated and pervious. Additional archaeological investigation within this area would be appropriate if this concept moved forward to planning and design, and belowground impacts are proposed.

10.14.2 2035 Scenario

The development concepts considered for the 2035 scenario augment those discussed above in the 2025 scenario and the potential effects on archaeological sensitive areas would be similar in most areas. Construction activity in the East Ramp, North Airfield, and Pine Hill areas would

continue to be confined to existing impervious areas previously disturbed with low archaeological sensitivity.

In the West Ramp area, potential development could occur within areas that are presently vegetated and pervious and are within areas of moderate/high archaeological sensitivity. Additional archaeological investigation within these areas would be appropriate if any of these concepts moved forward to planning and design, and belowground impacts are proposed.

10.15 Future Scenarios: Minute Man National Historical Park

This section assesses potential noise and traffic effects of the 2025 and 2035 scenarios on MMNHP. Specific areas of focus include the NPS's goals of physical protection and restoration of Battle Road; road traffic, public safety, and access to park facilities, particularly regarding speed and traffic congestion; management of air traffic to protect the visitor's experience in the park; and the future of Hanscom AFB. Noise level analyses identified DNL and TA values at contributing resources within the park and estimates of acreage of park within the 55 dB DNL contour for the 2025 and 2035 scenarios. Table 10-17 presents the sites with the ten highest DNL values in the Park.

Table 10-17 DNL Values of Sites in the Minute Man National Historical Park (in dB)

Label ¹	Name ²	Unit/Town ³	2005	2012	2017	2025	2035
MM-13	Noah Brooks Tavern (and Carriage House)	Battle Road Unit/Lincoln	53.4	51.4	55.0	53.6	54.0
MM-14	Job Brooks House	Battle Road Unit/Lincoln	53.0	51.5	54.6	53.3	53.7
MM-12	Samuel Brooks House	Battle Road Unit/Concord	52.5	50.8	54.4	53.2	53.6
MM-15	Joshua Brooks, Jr. House	Battle Road Unit/Lincoln	51.7	50.7	53.6	52.4	52.8
MM-16	Bloody Angle	Barrett Farm Unit/Concord	50.1	50.9	51.7	51.0	51.3
MM-10	Historic Farming Fields	Battle Road Unit/Concord	51.4	50.7	50.9	51.1	51.5
MM-11	Olive Stow House/Farwell Jones House/ Carty Barn	Battle Road Unit/Concord	50.5	49.2	50.6	50.3	50.6
MM-9	Meriam House	Battle Road Unit/Concord	52.1	50.6	50.5	51.2	51.6
MM-8	Meriam's Corner Monument	Battle Road Unit/Concord	51.9	50.3	50.3	50.9	51.3
MM-7	The Wayside (Samuel Whitney House) *	Wayside Unit/Concord	53.6	50.3	50.1	50.9	51.4
MM-1	Major John Buttrick House	North Bridge Unit/Concord	51.2	48.7	48.9	49.6	50.1
MM-2	NPS Headquarters and Visitor Center at 174 Liberty St. (Stedman Buttrick Residence)	North Bridge Unit/Concord	50.5	48.3	48.4	49.1	49.6
Notes: 1. The MMNHP is a National Historic Landmark district. All sites are in the National Register of Historic Places. The sites with the ten highest DNL values in 2017 are listed in order of their 2017 DNL value. 2. Sites within MMNHP are marked with an asterisk (*) if they are individually listed in the National Register of Historic Places. 3. Sites in the Battle Road Unit are located on the Battle Road Interpretive Trail.							

The evaluation of traffic identifies potential changes in Route 2A traffic volumes that are attributable to Hanscom Field. Chapter 6, Ground Transportation, describes Massport's support for Transportation Demand Management strategies to reduce its contribution to traffic on area roadways and potential traffic management strategies that do not require physical modification to intersections. As described in Chapter 8, there are no adverse effects attributable to air quality in 2017 or the 2025 and 2035 scenarios.

10.15.1 2025 Scenario

The environmental effects of traffic and noise on MMNHP from Hanscom planning concepts in the 2025 scenario are presented below.

Noise

In the 2025 scenario, none of the 31 noise analysis locations within, and no part of, MMNHP would be within the 65 dB DNL contour. The area of the park within the 55 dB DNL contour is projected to decrease in 2025 relative to the area in 2017. The DNL values at MMNHP sites would range from 45.5 dB to 53.6 dB. The highest level (53.6 dB) would occur at Noah Brooks Tavern (and Carriage House) (MM-13).

None of the 4.9-mile Battle Road Trail would be within the 65 dB DNL or 55 DNL contour in the 2025 scenario. It should be noted that a visitor to the Battle Road portion of the park is affected by the background noise of road traffic from Route 128/I-95 and Route 2A throughout most of the day.

Modeled DNL, TA65 and TA55 values at noise analysis locations along the Battle Road Trail indicate that predicted DNL and Time Above values along the trail are highest west of the Hartwell Tavern, reflecting the proximity of these sites to runways at Hanscom Field.

TA65 values ranged from 1.7 to 8.1 minutes at the 31 noise analysis locations with the highest levels occurring at Historic Farming Fields (MM-10 on Figure 10-12) in the Bedford Levels with value of 8.1 minutes in the 2025 scenario. TA55 values ranged from 18.8 to 66.8 minutes with the highest levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels in the 2025 scenario (Figure 10-13).

Traffic

Hanscom Field traffic remains a very small percentage of the overall volumes on the roadway in the 2025 scenarios. As discussed earlier in this chapter in 2018 Hanscom Field represented two percent of peak hour traffic on Route 2A. Hanscom Field traffic is forecasted to remain steady at these levels in both the 2025 and 2035 scenarios. Hanscom AFB and other local and regional traffic sources account for the rest of the traffic volumes.

In both the 2025 and 2035 scenarios, Hanscom Field traffic would exceed ten percent of a single traffic movement at only one intersection on Route 2A in the MMNHP (#6) Route 2A/Hanscom Drive in Lincoln.

10.15.2 2035 Scenario

The environmental effects of traffic and noise on MMNHP from Hanscom planning concepts in the 2035 scenario are presented below.

Noise

In the 2035 scenario, none of the 31 noise analysis locations at MMNHP would be within the 65 dB DNL contour. The area of the park within the 55 dB DNL contour is projected to decrease in 2035 relative to the area in 2017. The predicted DNL values at MMNHP sites would range from 45.9 dB to 54.0 dB. The highest predicted level (54.0 dB) would occur at the Noah Brooks Tavern (and Carriage House) (MM-13). In the 2035 scenario, 0.4 acres of the MMNHP would be within the 55 dB DNL contour up from 0 acres in the 2025 scenario.

None of the 4.9-mile Battle Road Trail would lie within the 55 or 65 dB DNL contour in the 2035 scenario.

TA65 values would range from 1.9 to 8.7 minutes at the 31 noise analysis locations, with the highest levels occurring at Historic Farming Fields (MM-10) in the Bedford Levels in the 2035 scenario (Figure 10-12). TA55 values would range from 20.5 to 71.1 minutes, with the highest predicted levels occurring at the Historic Farming Fields (MM-10) in the Bedford Levels (Figure 10-12). Similar to the 2025 scenario, DNL and Time Above values, along the trail would be highest west of the Hartwell Tavern.

10.16 Environmentally Beneficial Measures

This section presents a summary of possible environmentally beneficial measures that have been identified to address the predicted effects of Hanscom Field on historical and cultural resources in the 2025 and 2035 scenarios. The development and implementation of these improvements would occur in the future in response to actual conditions and anticipated environmental effects. More discussion of potential strategies is presented in Chapter 11 Sustainability and Environmental Management.

Historic Resources

The inclusion of several tiered categories of updated information about historic resources in the 2017 *ESPR* provides a comprehensive basis for future analyses in the event that a specific project is developed for implementation. These include the up-to-date compilation of National and State Registers-listed historic resources, the data on current MHC Inventory and MACRIS resources; and the results of the historic resources reconnaissance survey completed to capture other historic resources that are 50 years old or older in the 2012 *ESPR* and updated in the 2017 *ESPR*. Traffic measures discussed in Chapter 6 focus on improvements that do not require physical changes to the roadways, as Massport has limited operational impact on the ground transportation network in the area of Hanscom Field for the scenarios analyzed (existing, 2025 forecast, and 2035 forecast). Possible noise mitigation measures could include operational measures of a voluntary nature such as those reported in Chapters 7 and 11.

Archaeological Resources

Any disturbance in areas of archaeological sensitivity or near known archaeological sites has the potential to impact archaeological resources. The reconnaissance survey for the 2012 *ESPR* and the 2017 *ESPR* update will guide future studies to identify and evaluate these areas in the event that a specific project is contemplated. Possible measures, if they are needed, may include project design approaches to avoid an archaeological site or sensitive area, site protection during construction, or data recovery excavations if a site cannot be avoided.

Minute Man National Historical Park

Possible noise mitigation strategies to reduce effects on historical sites could include continued operational measures of a voluntary nature such as those reported in Chapters 7 and 11. The federal interagency working group that was formed to review impacts on MMNHP may provide specific recommendations in the future that should be considered. Future noise recommendations may also be derived from the NPS soundscape plan for MMNHP.

11

Sustainability & Environmental Management



Massport recognizes the importance of sustainability and seeks to incorporate and encourage sustainable practices as an integral component of the agency's general operating and development philosophy. Massport takes a holistic approach, managing its facilities to ensure economic viability, operational efficiency, natural resource conservation, and social responsibility. The organization's primary responsibility at Hanscom Field is to maintain a safe, secure, and efficient regional airport while minimizing the environmental impact of its operations. Massport's sustainability vision also includes a Resiliency Program, which exists to improve the ability of their infrastructure and

operations to withstand disruptive events and recover within a reasonable timeframe.

This chapter provides a high-level overview of sustainable management concepts, the current state of practice in the airport industry, and specific sustainability initiatives in place at Hanscom Field. The chapter also includes Massport's approach to addressing climate change and increasing the resiliency of infrastructure and operations at Hanscom Field. Finally, the chapter covers Massport's Environmental Management System (EMS), and an update to the current, ongoing and planned environmentally beneficial measures.

11.1 Key Findings Since 2012

Massport is a leader among Massachusetts agencies in the promotion and implementation of sustainable design and operations. In 2015, Massport developed a Sustainability Management Plan (SMP) for Logan Airport and the following year, Massport published its first Boston Logan International Airport Annual Sustainability Report to document the progress and challenges of its sustainability initiatives included in the SMP. In 2018, Massport expanded the scope of the Sustainability and Resiliency Report¹⁶⁹ to include all of its facilities, including Hanscom Field. This report includes an added focus on resiliency efforts and climate change adaptation planning, reflecting Massport's commitment to strengthening facility operations, infrastructure, and workforce in the face of climate change. The addition highlights the fact that sustainability and resilience are interrelated concepts and both must be addressed to ensure the longevity of Massport facilities and investments. Massport's increased emphasis on resiliency also aligns with Massachusetts state-level guidance to address climate change through adaptation, risk mitigation, and increased resilience, as discussed in Section 11.3.

Massport continues to build on its efforts and commitments to sustainable development. Massport encourages that all new development, including development at Hanscom and by its tenants, meet the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Silver certification requirements.¹⁷⁰ LEED certification is achieved through the incorporation of sustainability commitments in building design and operation, including energy efficiency, water efficiency, use of environmentally friendly building materials and products, reuse and recycling, and renewable energy.

Massport and Hanscom tenants are committed to reducing the environmental impact of their facilities and operations at Hanscom. Examples include:

- ⇒ 222 solar photovoltaic (PV) panels on Massport's Hanscom Civil Air Terminal provide onsite renewable energy, reducing the facility's demand for power from offsite electricity sources. The 51 kW capacity solar installation currently supplies 4 percent of the Civil Air Terminal building's annual energy needs;
- ⇒ Construction on Massport's permanent Airport Rescue & Firefighting (ARFF) and United States Customs and Border Protection (USCBP) facility broke ground in June 2018. The facility is designed to LEED Gold standards, including use of sustainable construction practices utilizing locally sourced building materials that were extracted, harvested or recovered, as well as manufactured within a 500 mile radius of the building site;

¹⁶⁹ Massport. 2018. *Sustainable Massport, Annual Sustainability & Resiliency Report*.

http://www.massport.com/media/2774/massport-annual-sustainability-and-resiliency-report-2018_lr.pdf

¹⁷⁰ The U.S. Green Building Council LEED Green Building Rating System is a global framework to guide the development of sustainable, energy-efficient buildings.

- ⇒ Jet Aviation recently constructed a new hangar and fixed-base operator (FBO) facility which is built to LEED Silver standards, incorporating sustainable design elements such as high efficiency condensing boilers and LED lighting;
- ⇒ A 200 kW rooftop solar PV system installed on Boston MedFlight's recently constructed hangar and corporate headquarters facility is designed to supply all facility electricity needs. The facility is also designed to LEED Silver standards; and
- ⇒ All major tenants at Hanscom have a recycling program to redirect a portion of their facility waste from landfills.

11.2 Concept of Sustainability

The concept of sustainability acknowledges the inter-relationships among economic, environmental, and societal needs. One of the first widely accepted definitions of sustainability was developed by the World Commission on Environment and Development in 1987, and states that sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."¹⁷¹

A sustainable approach to planning, design, construction, and operations considers three elements: 1) the economy, 2) the environment, and 3) society. Also called the "triple bottom line", this approach to sustainability is characterized by considering the balance and interconnectedness among the three elements. Balancing economic development, environmental stewardship, and social responsibility facets is a challenge for every organization to consider regarding sustainable development projects and sustainability initiatives.

Figure 11-1 Triple Bottom Line Concept (Economic, Environmental and Social)



¹⁷¹ World Commission on Environment and Development (WCED). 1987. *Our Common Future*, the Report of the Brundtland Commission, published by Oxford University Press.

Finally, sustainability as a concept encourages the identification of and engagement with relevant stakeholders, as well as the tracking and reporting on key metrics in order to facilitate continuous improvement. While individual organizations can develop sustainability plans specific to their needs, there are some common guiding principles¹⁷², including:

- ⇒ Reduce reliance upon non-renewable resources such as fossil fuels, metals, and minerals;
- ⇒ Reduce consumption of chemicals and other synthetic compounds that are not easily assimilated by biological systems;
- ⇒ Reduce or reverse the progressive degradation of natural systems resulting from development and other human activities; and
- ⇒ Help people meet their hierarchy of economic and social needs in fair and efficient ways.

As described further in Section 11.4, the airport industry has also added operational efficiency as a fourth element, or consideration, to the concept of sustainability, which reflects the specific needs of airports.

11.3 Regulations, Monitoring, & Reporting

Massport looks to voluntary guidance from the Commonwealth of Massachusetts concerning various sustainability, energy, and climate adaptation and resilience topics, in addition to complying with all mandatory regulations.

Operations and facility development at Hanscom are governed by both state and federal environmental regulations, which require monitoring and reporting to ensure compliance. Section 11.3.1 contains information concerning air quality, water quality, and hazardous waste regulations and guidance.

Massport has voluntarily adopted several proactive policies and programs to assist in monitoring environmental performance and to identify opportunities to improve Massport's environmental programs. These include an Environmental Management System (EMS) (refer to Section 11.5.1) and various reporting initiatives. As part of the EMS, an annual performance review is conducted, including a regulatory compliance audit, peer review and a third party ISO 14001 certification audit, which becomes the basis for selecting new objectives and targets for continuous improvement. The annual review evaluates environmental performance for a number of parameters, including energy efficiency and watershed protection.

¹⁷² The Natural Step. 2018. *Approach and Sustainability Principles*. <https://thenaturalstep.org/approach/>

Since the development of its Sustainability Management Plan in 2015, Massport voluntarily publishes an Annual Sustainability and Resiliency Report that describes sustainability initiatives at all of their facilities, including projects implemented at Hanscom.

Non-mandatory state-level guidance that Massport considers:

- ⇒ Executive Order 385 Planning for Growth (1996);
- ⇒ Executive Order 438 State Sustainability Program;
- ⇒ Executive Order 484 Leading by Example – Clean Energy and Efficient Buildings (2007);
- ⇒ Global Warming Solutions Act (2008);
- ⇒ Executive Order 569 Establishing an Integrated Climate Change Strategy for the Commonwealth (2016);
- ⇒ State Hazard Mitigation and Climate Adaptation Plan (2018);
- ⇒ Massachusetts Comprehensive Energy Plan (CEP);
- ⇒ Statewide Resilience Master Plan (SRMP); and
- ⇒ Massachusetts Department of Transportation (MassDOT) Statewide Climate Change Adaptation Plan.

Ongoing monitoring and reporting practices at Hanscom include:

- ⇒ Use of the EMS to track, manage, and improve environmental compliance and performance;
- ⇒ Annual *State of Hanscom* report;
- ⇒ Annual Massport-wide Sustainability and Resiliency reports;
- ⇒ Periodic Environmental Status & Planning Reports (ESPRs);
- ⇒ Quarterly inspection of Massport facilities by a third-party to ensure environmental compliance;;
- ⇒ Requirement for tenants to conduct an annual third-party environmental compliance audit for their operations at Hanscom; and
- ⇒ All required reporting related to implementation of the Clean Water Act, described under Section 11.3.1, Water Quality.

Massport has voluntarily adopted several proactive policies and programs to assist in monitoring environmental performance and to identify opportunities to improve Massport's environmental programs. These include an Environmental Management System (EMS) (refer to Section

In addition, every year Massport prepares *The State of Hanscom* report which is presented to the Hanscom Field Advisory Commission (HFAC), a legislatively created body comprised of representatives from the surrounding residential areas, organizations, and members of the aviation community. The presentation to the HFAC provides stakeholders with an opportunity to discuss the role of Hanscom Field in the regional transportation system and Massport's objectives for the airport, including environmental and sustainability activities. The report notes that Massport meets its environmental commitments using a series of programs that include monitoring and auditing activities at Hanscom to ensure compliance with environmental regulations and the use of pollution prevention practices.

11.3.1 Required Environmental Regulations

Massport complies with a number of environmental regulations that are applicable at Hanscom. Compliance with state and federal regulations is handled through monitoring and reporting initiatives, which are further explained in the following sections.

Air Quality

The Federal Clean Air Act (CAA) requires that states meet and maintain National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO₂), particulate matter ≤ 10 microns (PM₁₀) and ≤ 2.5 microns (PM_{2.5}), lead (Pb), and nitrogen dioxide (NO₂). The U.S. Environmental Protection Agency (EPA) sets NAAQS at levels intended to protect public health and the environment. The Massachusetts Department of Environmental Protection (MassDEP) is the state agency responsible for monitoring outdoor air quality in Massachusetts and developing plans and regulatory programs to reduce emissions of pollutants that adversely affect public health, welfare, and the environment. The Greater Boston area, including the Hanscom Field communities, is currently in attainment with all Massachusetts and National Ambient Air Quality Standards (NAAQS). Refer to Chapter 8 for further information regarding air quality terminology, standards, and conditions.

At Hanscom, measures are taken to mitigate air quality impacts from facilities and operation, such as:

- ⇒ Utilizing the holding area at the head of Runway 23 to reduce minor aircraft delays and prevent associated emissions from engine idling;
- ⇒ Using ultra low sulfur diesel fuel in Massport fleet vehicles;
- ⇒ Encouraging FBOs to minimize aircraft auxiliary power unit use;
- ⇒ Promoting the purchase of alternatively fueled ground service equipment for tenants, where appropriate;
- ⇒ Considering alternative fuel vehicles for any new Massport vehicle purchase.

Water Quality

The federal Clean Water Act (CWA) requires permits for pollutant discharges into United States waters from a point source and for stormwater discharges associated with industrial activities. Permits are issued under the Federal EPA's National Pollutant Discharge Elimination System (NPDES) Program. Presently, Massport holds a NPDES Multi-Sector General Permit for stormwater discharges at Hanscom. Massport requires that all development and facility operations conform to the requirements of the 2015 NPDES permit for Hanscom Field. All activities are also required to meet applicable standards for stormwater management required for site development or redevelopment by MassDEP.

Massport collaborates with MassDEP and the U.S. Air Force (USAF) to take actions to reduce impacts of Hanscom area activities on the Shawsheen River Watershed. Cooperatively, the

agencies have assessed current impacts of stormwater through modeling of discharges in the drainage area. Massport continues to evaluate stormwater controls and BMPs for reducing peak runoff rates and increasing stormwater infiltration.

A major component of Massport's water pollution prevention program is the development and implementation of a comprehensive stormwater pollution prevention plan (SWPPP). Massport published its most recent Storm Water Pollution Prevention Plan (SWPPP) for Hanscom in October 2015, with subsequent updates to reflect changes in the facility and tenants, which integrates both stormwater management and monitoring components. As described in the plan, Massport and its tenants have implemented a number of programs and management practices to reduce the potential for pollutants to be released into the storm drainage system. Many of the ongoing practices are focused on education and implementation of pollution source reduction techniques, and improved handling practices. Best management practices (BMPs) for stormwater control include good housekeeping practices, preventative maintenance, material compatibility and system inventory, spill prevention and response, and employee training.

Massport will continue to reduce or eliminate potential water quality impacts from Hanscom Field in the future by:

- ⇒ Tracking the progress of the Installation Restoration Program (for environmental cleanup) and the USAF's progress toward site closure as described in Chapter 9 Wetlands, Wildlife and Water Resources;
- ⇒ Performing regular visual inspections of water quality at Hanscom Field stormwater outfalls in accordance with its SWPPP and the NPDES permit;
- ⇒ Enforcing MassDEP's policy requiring that stormwater runoff for new projects does not increase peak runoff rates;
- ⇒ Implementing Hanscom Field's Spill Prevention Control and Countermeasure (SPCC) Plan to ensure that all of Massport operated storage tanks are in compliance with current regulations and to monitor the age, condition, and regulatory compliance status of these tanks on an ongoing basis through the Tank Management Program;
- ⇒ Requiring that tenants conduct annual environmental audits to document compliance with tank regulations;
- ⇒ Employing pollution prevention measures as they apply to site drainage, material storage, material transfer, truck unloading operations, and site security as part of the SPCC Plan;
- ⇒ Providing annual spill, stormwater, and hazardous waste management training for Massport employees;
- ⇒ Directing new development to areas with existing impervious surfaces and stormwater infrastructure;
- ⇒ Identifying and removing existing impervious surfaces where feasible to increase infiltration;

- ⇒ Installing weirs to reduce peak flows; and
- ⇒ Placing floating booms at outfalls.

Hazardous Materials/Toxics

Hanscom Field is a Very Small Quantity generator (< 220 lbs. /month) of Resource Conservation and Recovery Act (RCRA) regulated hazardous waste and a Small Quantity generator (< 2,200 lbs. /month) of Massachusetts regulated hazardous waste.¹⁷³ Massport is committed to reducing the potential for the discharge and release of toxic materials, and pollution prevention is part of Massport's Storm Water Pollution Prevention Plan (SWPPP). Less toxic and non-toxic alternatives are evaluated and implemented where applicable. Massport and its tenants also adhere to Spill Prevention Control and Countermeasure (SPCC) Plans, ensuring that hazardous materials storage tanks are in compliance with regulations and monitoring them to maintain compliance.

Through Hanscom's EMS, Massport periodically looks for ways to reduce the use of toxic materials including evaluation of products for replacements with non-toxic alternatives. For example, solid-form sodium formate was selected for deicing at Hanscom after a careful evaluation of other options that were both FAA-approved and that met Clean Water Act receiving water standards.

Massport conducts a comprehensive annual audit, which began in 2016, to inventory chemicals in use and storage at Hanscom Field. In addition, improved tracking methods were employed to identify opportunities for reducing and eliminating the amount of hazardous materials on site. Massport initiated improved housekeeping strategies to consistently label and store hazardous chemicals and waste. Massport plans to further improve purchasing practices in order to eliminate duplicative product purchases. Reduction of toxic materials means that less hazardous waste is produced, thereby minimizing impacts to the environment and saving costs associated with waste disposal. In keeping with this goal, potential sources of spills or contamination are also carefully managed.

Massport also works with its tenants to identify ways to reduce the amount and toxicity of certain products used at Hanscom Field. Massport involves the tenants in achieving environmental compliance and pollution prevention, including providing ongoing technical assistance to tenants regarding new regulations and means for compliance through an inspection program conducted by the Environmental Management Unit. In addition, educational materials, including notices of upcoming regulatory requirements, are distributed on pollution prevention, stormwater best management practices, spill prevention and response procedures, and other topics.

¹⁷³ MassDEP. November 2018. *List of Massachusetts Hazardous Waste Generators, November 13, 2018.*
<https://www.mass.gov/guides/hazardous-waste-generation-generators#generator-status-storage-limits>

11.4 State of Practice in the Airport Industry

As noted previously, many airports have voluntarily adopted an approach to sustainability that accounts for the triple bottom line plus operations, or “EONS” (Economic vitality, Operational efficiency, Natural resources, and Social responsibility). The EONS approach emphasizes operational efficiency, which is a critical consideration of all airport sustainability initiatives. Due to an increased focus on the EONS approach to sustainability, many North American airports have begun or continue to issue regular environmental and/or sustainability reports, or develop formal Sustainability Management Plans (SMP).¹⁷⁴ There is also an increased focus on sustainable design and construction, and operations and maintenance of airport facilities. As of October 2017, there were LEED airport projects registered in almost all 50 U.S. states and over 40 foreign countries and territories.¹⁷⁵ Massport continues to stay abreast of these advancements and participates actively in many sustainability initiatives.

Figure 11-2 Airport Industry Concept of Sustainability (EONS)



Table 11-1 displays some resources available to agencies operating airports that have been developed or enhanced since 2012. These include resources from: Airports Council International (ACI) and its North American region (ACI-NA), Sustainable Aviation Guidance Alliance (SAGA), the National Academy of Sciences’ Airport Cooperative Research Program (ACRP), and the Federal Aviation Administration (FAA).

¹⁷⁴ Airports Council International-North America (ACI-NA). September 2016. *2016 Environmental Benchmarking Survey*. <https://www.aci-na.org/sites/default/files/envirobenchmarkingsurvey.pdf>

¹⁷⁵ USGBC. October 2017. *USGBC Releases LEED in Motion: Transportation Report (Press Release)*. <https://www.usgbc.org/articles/usgbc-releases-leed-motion-transportation-report>

Table 11-1: Key sustainability resources developed or enhanced since 2012, for reference by agencies operating airports

Agency/ Organization	Resource/ Effort	Purpose
Airport Cooperative Research Program	ACRP conducts a variety of research to benefit airports	Publications cover many topics in the environmental field, including various aspects of sustainability as related to airports. ¹
ACI-NA	Environmental Affairs Committee, Sustainability Working Group ²	Provides guidance and industry best practices on environmental management, sustainability, regulations and policies applicable to airports and their tenants.
	Environmental Goals	Updated goals in 2015, including specific actions airports may consider to meet the goals based on the unique requirements of their individual facilities. ³
	Environmental Benchmarking Survey	Provides insight into industry environmental management activities and collective progress on sustainability initiatives.
ACI World	World Environmental Standing Committee	Provides guidance and industry best practices on environmental management and sustainability initiatives applicable to airports and their tenants. ACI also developed the Airport Carbon Emissions Reporting Tool, a framework to develop greenhouse gas emissions inventories for airports. ⁴
FAA	Airport Improvement Program (AIP) Grants	Assist airports in sustainability planning, energy efficiency, and renewable energy projects.
	Sustainable Master / Management Plan Guidance	FAA developed lessons learned guidance from the Airport Sustainable Master / Management Plan pilot program. ⁵
	Solar and Recycling Guidance	FAA published a memo in 2014, "Guidance on Airport Recycling, Reuse and Waste Reduction Plans". ⁶ and updated the "Technical Guidance for Evaluating Selected Solar Technologies at Airports".
SAGA	Sustainable Aviation Guidance Alliance Database	Comprehensive list of sustainability strategies, practices, projects and technologies at airports, serves as free resource to airport operators. ⁷

Notes:

1. Airport Cooperative Research Program, <http://www.trb.org/ACRP/ACRP.aspx>.
2. Massport is a member of ACI-NA, and staff serve on the Environmental Affairs Committee.
3. Airports Council International-North America (ACI-NA). 2018. *ACI-NA Environmental Goals*. www.aci-na.org
4. ACI World. *Airport Carbon Emissions Reporting Tool (ACERT)*. <https://aci.aero/About-ACI/Priorities/Environment/ACERT/>
5. FAA Airport Sustainability website, <https://www.faa.gov/airports/environmental/sustainability/>.
6. FAA Recycling Guidance, <https://www.faa.gov/airports/environmental/media/airport-recycling-reuse-waste-reduction-plans-guidance.pdf>
7. Sustainable Aviation Guidance Alliance (SAGA) database. <http://www.airportsustainability.org/>

Massport is committed to minimizing the impact of its operations on both the natural and human environments through a wide array of initiatives and programs. These include:

- ⇒ Environmental Management System;
- ⇒ Sustainable Planning, Design, and Construction;
- ⇒ Sustainable Operations and Maintenance;
- ⇒ Climate Adaptation and Resiliency;
- ⇒ Regional Economic Contributions; and
- ⇒ Social Sustainability initiatives.

11.5 Sustainability at Hanscom Field

This section provides details of Massport's current and planned sustainability practices at Hanscom Field which fall into the categories above.

11.5.1 Environmental Management System

The International Organization for Standardization (ISO) 14000 series of international standards address environmental management issues associated with the activities, products, or services provided by an organization. The standards are designed to be applicable to organizations of any type and size. The voluntary program involves creating an Environmental Management System (EMS), to include a corporate environmental policy, environmental performance evaluation, and comprehensive system auditing. This process allows for continual evaluation and improvement in environmental performance.

In November 2000, the Massport Board approved an Environmental Management Policy that states, "Massachusetts Port Authority (Massport) is committed to operate all its facilities in an environmentally sound and responsible manner. Massport will strive to minimize the impact of its operations on the environment through the continuous improvement of its environmental performance and the implementation of pollution prevention measures, both to the extent feasible and practicable in a manner that is consistent with Massport's mission and goals."

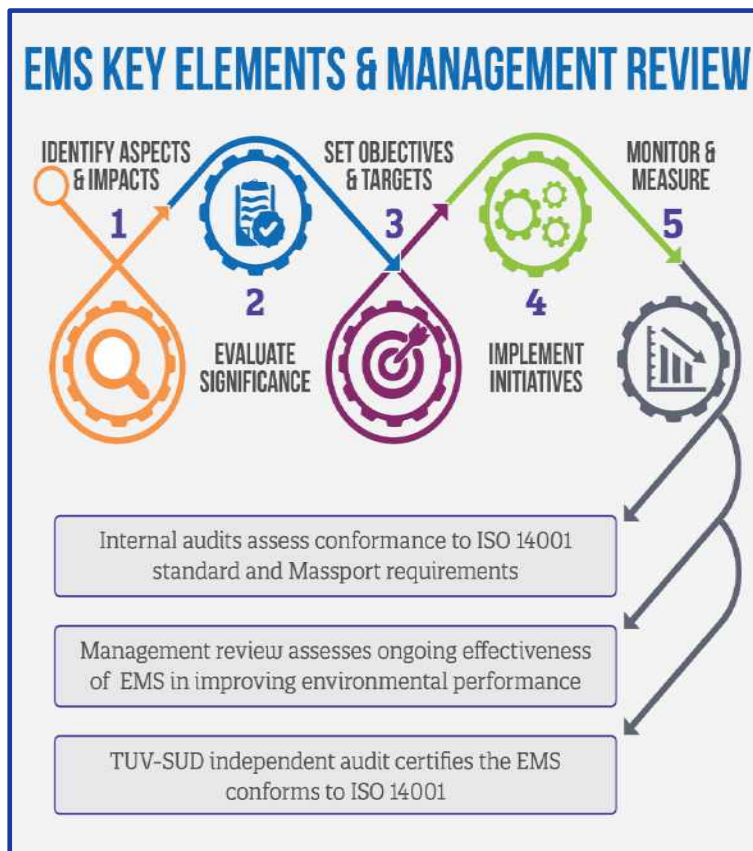
In order to successfully implement its environmental management policy, Massport is committed to developing and maintaining management systems designed to:

- ⇒ Ensure that the environmental management policy is available to staff, tenants, customers and the general public;
- ⇒ Ensure compliance with all applicable laws and regulations;
- ⇒ Ensure that environmental considerations are included in the business, financial, operational, and programmatic decisions, including feasible and practicable options for potentially exceeding compliance with applicable regulatory requirements;

- ⇒ Define and apply sustainable design principles in the planning, design, operation and decommissioning of its facilities;
- ⇒ Define and establish environmental objectives, targets, and best management practices and monitor performance;
- ⇒ Provide training to and communication with staff and affected tenants regarding environmental goals, objectives, and targets and their respective roles and responsibilities in fulfilling them;
- ⇒ Incorporate monitoring of Massport and Massport tenants' environmental activities;
- ⇒ Include the preparation of an annual environmental performance report, which will be made available to staff, tenants, customers and the public.

In May 2001, Hanscom Field became the first airport in the U.S. to receive ISO 14001 certification through the development and implementation of its Environmental Management System (EMS). The EMS provides a mechanism for systematic identification and prioritization of risks and opportunities for improvement by setting objectives and targets that are evaluated at regular intervals.

Figure 11-3 EMS Key Elements & Management Review



Massport's ISO 14001 certification requires regular third party audits to ensure that it demonstrates continued improvement. These are performed by an internal auditor annually and then by a third-party auditor every three years. At Hanscom, key EMS objectives include: reducing energy use, reducing hazardous material use, reducing the amount of contaminants entering storm water systems, increasing tenant solid-waste recycling, improving housekeeping methods to safely store and label hazardous materials, and ensuring employee and tenant training initiatives are completed. Hanscom Field's most recent EMS ISO re-certification audit was conducted in May 2018.

Hanscom's EMS fosters teamwork to improve environmental

performance. The EMS provides a framework to improve the structure and functions of the organization, enhance processes for getting work done, and incorporate technologies that enable continuous improvement. Hanscom leadership engages in efforts to focus on their “people” who support the EMS efforts by working toward greater staff engagement, enhancing information flows, and maintaining effective documentation. In this regard, management review is a key element to the EMS at Hanscom Field. Senior managers regularly review the EMS, ensure adequate resources are available, and determine next steps. A management review meeting is held annually to review the results of periodic audits and to determine if changes to the system are required.

Figure 11-4 Massport Environmental Management System Concept



In addition, Massport employees are regularly trained to ensure awareness of risks to the environment associated with facility operations, to support continued ISO 14001 certification, and to facilitate continuous improvement. Training topics include compliance requirements such as the management of hazardous materials and waste, stormwater pollution prevention, and spill prevention and response.

11.5.2 Sustainable Planning, Design, and Construction

Massport provides regular updates on its development activities and project updates at Hanscom Field through monthly Hanscom Field Advisory Commission (HFAC) meetings and the annual *State of Hanscom* reports. Public outreach and information sharing is facilitated with local stakeholders including the towns of Bedford, Concord, Lexington, and Lincoln, as well as the Hanscom AFB and the Minute Man National Historical Park.

The 2017 *ESPR* is intended to provide baseline conditions and a comprehensive review of the cumulative environmental effects of development and operations at Hanscom Field to inform the planning and review of future activities and projects. Individual environmental filings are required for any specific project that meets or exceeds the Massachusetts Environmental Policy Act (MEPA) or the National Environmental Policy Act (NEPA) regulatory threshold for review.

Massport encourages sustainable and resilient planning, design, and construction of all development at Hanscom through:

- ⇒ Use of Massport's Sustainability and Resiliency Design Standards & Guidelines;
- ⇒ Encouraging LEED certification (Silver or better);
- ⇒ Locating new water, sewer and stormwater drainage systems within already developed areas when feasible;
- ⇒ Implementing soil erosion and sediment control measures during construction;
- ⇒ Designing facilities that require septic systems in accordance with Title 5 regulations;
- ⇒ Using BMPs to ensure that relevant stormwater runoff rates are not increased both during construction and in future operating conditions;
- ⇒ Minimizing impacts to undeveloped areas.

Under MEPA, proposed projects are subject to a project-specific environmental review process with opportunities for public comment. Many projects subject to NEPA also have opportunities for public comment.

Massport is not subject to local zoning; however, projects involving work within wetland resource areas or their buffer zones involve applications to the appropriate conservation commissions for permitting as required under the Massachusetts Wetlands Protection Act. Massport takes every precaution to avoid, minimize, and mitigate potential wetland impacts of development.

The opening of a renovated facility and related site upgrades by Jet Aviation, a long-time Hanscom tenant, is a prime example of a project designed and implemented using sustainable planning, design, and construction principles. In 2017, Jet Aviation opened a newly constructed 40,000 square foot hangar, office and commercial space, and Fixed Base Operator (FBO) facility. In addition, upgrades were made to its ramp, apron, entrance roadway, parking and utilities onsite.

The upgraded facilities are designed to improve safety and efficiency while decreasing the environmental impacts associated with the facility. It was designed and built in accordance with LEED Silver certification standards. Key sustainable design elements include energy efficient LED lighting, condensing boilers, radiant flooring, water conservation technologies related to landscaping and water reuse, and

Figure 11-5 Jet Aviation Hangar Built to LEED Standards



use of recycled materials for building construction. Jet Aviation is ISO 14001 and OHSAS 18001 certified, maintaining an EMS to foster continuous environmental improvement.

Sustainability and Resiliency Design Standards and Guidelines (SRDSG)

Massport adopted a comprehensive set of standards and guidelines for sustainable planning, design, and construction in 2009, followed by an updated version released in December of 2018.¹⁷⁶ The Sustainability and Resiliency Design Standards and Guidelines (SRDSG) are available electronically as a resource for architects, engineers, and planners working on Massport capital projects, as well as tenants and third-party developers of Massport properties.

The SRDSG includes general standards relating to project management, documentation, public involvement, systems commissioning, and operational and maintenance programs. It also includes guidance on project site design and project materials. The guidelines cover energy management and efficiency measures, air quality measures, water management and efficiency measures, and measures to improve indoor air quality and occupant comfort. Examples of technologies encouraged in the SRDSG include natural day-lighting, passive solar gain, natural cooling, energy-efficient HVAC equipment, environmentally beneficial building materials, and energy use monitoring.

LEED Certification

Massport encourages all development projects greater than 20,000 square feet in size strive to meet the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Silver certification requirements or better. The LEED Green Building Rating System was established in 2000, as a third-party certification program for "the design, construction, and operation of high performance green buildings." The LEED rating system can be used to evaluate many project types, including new construction, renovations, retrofits, and the operation of existing buildings.

According to the USGBC and substantiated by many case studies, LEED buildings generally:

- ⇒ Cost less to operate and maintain;
- ⇒ Generate higher energy and/or water-efficiencies;
- ⇒ Demonstrate higher rent values than conventional buildings in their markets;
- ⇒ Provide a healthier and safer indoor environment for occupants;
- ⇒ And embody the environmental or sustainability values of the organizations that build, own, and occupy them.

¹⁷⁶ Massachusetts Port Authority, *Sustainability and Resiliency Design Standards and Guidelines (SRDSG)*. December 2018. Available at: <http://www.massport.com/media/3111/massport-sustainability-and-resiliency-design-standards-and-guidelines-dec2018.pdf>

To obtain LEED certification, building designs must be registered with USGBC for review and verified through a third party. LEED provides the framework for a point-based rating system in which the number of points achieved across a number of “impact categories” are awarded based on the number of sustainable design elements incorporated.¹⁷⁷ The number of points achieved determines which of the four increasingly stringent levels of LEED certification a project is eligible to obtain (Certified, Silver, Gold, and Platinum). The USGBC also provides training and accreditation for design professionals.

In June 2018 Massport began constructing its permanent ARFF and United States Customs and Border Protection (USCBP) Building facility at Hanscom Field, which is designed to LEED Gold standards (and currently seeking certification). Sustainability considerations were incorporated throughout the buildings’ planning, design, and construction phases. Innovative whole building energy simulation modeling was utilized by architects during the design process to optimize energy performance, projected to achieve 30 percent energy savings. Materials for the building were locally sourced within a 500 mile radius of the building site, to reduce emissions associated with transporting them. The building incorporates efficient plumbing fixtures and components which aim to reduce its operational water consumption by 45 percent. It also takes advantage of natural day lighting and windows to decrease energy use necessary for lighting purposes.

Figure 11-6 Boston Medflight Facility Utilizing Large Skylights for Day-lighting



At Hanscom Field, tenant facility designers are also encouraged to achieve higher levels of LEED certification through the incorporation of innovative sustainable design and operational elements. Rectrix achieved many credits toward LEED certification for its newly constructed hangar and fixed base operator facility. Boston MedFlight’s new hangar and headquarters facility meets LEED Silver standards as well. Key green features incorporated into the design of these facilities include day-lighting, energy-efficient systems, and use of environmentally friendly and locally sourced building materials.

¹⁷⁷ U.S. Green Building Council. LEED Green Building Certification System, FAQ.
<https://www.usgbc.org/sites/default/files/Docs3330.pdf>.

Hanscom AFB, although not a Massport facility or tenant, is in close proximity to Hanscom Field and continues to increase the efficiency and resiliency of facilities on their property, designing to LEED standards when possible. The Massachusetts National Guard, Joint Force Headquarters facility (located on the AFB and opened in 2013) is designed to LEED Gold standards, incorporating energy modeling design, regenerative elevator drives, point-of-use controls, and no-irrigation landscaping, among other sustainable design features. Hanscom Middle School is another example of a new facility located on the AFB (opened in 2016), which is designed to LEED Silver standards, incorporating sustainable features such as solar power, a green roof, stormwater capture systems and bio-treatment capability. In terms of increasing resilience, Hanscom AFB is one of two bases in the Air Force that is participating in the “Energy as a Service” pilot study intended to develop examples of viable strategies for partnering with industry to improve the capability of the Air Force to provide on-base electric utility systems¹⁷⁸, a component of which may eventually involve installation of a solar facility on-site at Hanscom AFB.

Energy Efficiency and Renewable Energy

Energy efficiency and renewable energy requirements are often stipulated in the environmental permitting documents and commitments as well as lease agreements. In addition to following the SRDSG and supporting the LEED credits for energy in new or rehabilitated buildings, Hanscom Field has invested a significant effort into post-construction energy-efficiency projects as well. For example, once in operation, Massport’s new ARFF and USCBP facility is expected to obtain 70 percent of its electricity from off-site renewable energy sources over a 2-year period.

Massport invested in a roofing system on Hanscom’s Civil Air Terminal which includes a 51-kilowatt capacity solar photovoltaic (PV) facility comprised of 222 solar panels. The solar panels are mounted on the roof and on the south facing wall of the structure and installation was

¹⁷⁸ Official United States Air Force Website. “Air Force seeks energy innovation ideas.” July 21, 2017.
<https://www.safie.hq.af.mil/News/Article-Display/Article/1254551/air-force-seeks-energy-innovation-ideas/>

completed in 2011. The system was modeled to produce over 57,233 kilowatt-hours (kWh) of electricity per year, or up to 10 percent of the total building electricity requirement.

Figure 11-7 Solar PV Panels on Hanscom Field Civil Air Terminal



In addition, Massport partnered with Hanscom AFB, MIT Lincoln Laboratory (MIT-LL), U.S. Air Force Office of Energy Assurance and Massachusetts Military Asset & Security Strategy Task Force on an application to the Massachusetts Clean Energy Center, Community Microgrids Program through which the Hanscom community received funding for a microgrid feasibility assessment. The program is intended to advance community microgrid projects through their early feasibility stages in order to set the stage for future investment. It intends to develop community

microgrids in the state to improve efficiency, decrease GHGs, lower energy costs, and increase resilience. This specific microgrid would be intended to support the assets of the partner organizations and ensure Hanscom Field maintains power to serve as a reliever air field to Logan Airport during regional emergencies and natural disasters.¹⁷⁹

Hanscom tenants have also taken on their own innovative projects to increase energy efficiency and embrace renewable energy options. Several tenants report replacing conventional lights with LED lighting in their buildings and hangars. Jet Aviation retrofitted its existing hangar with LEDs and reported a return on investment after four months. In addition, four tenants utilize radiant floor heating to reduce the energy needs of their facilities while maintaining occupant comfort.

Boston MedFlight's recently constructed hangar and corporate headquarters incorporates a rooftop 200 kW solar PV facility, designed and optimized to meet all electrical needs of the facility on a typical summer day. The facility

Figure 11-8 Boston MedFlight's 200 kW Rooftop Solar PV Installation



¹⁷⁹ Massachusetts Clean Energy Center. "Community Microgrids Program: Feasibility Assessment Award Summary." <http://files.masscec.com/Community%20Microgrid%20Awardee%20Summary.pdf>

was designed with three high-efficiency gas fired boilers to supply potable hot water. The boilers also supply water for the radiant heat system that heats the 19,000 square foot hangar floor, 10,000 square foot aircraft apron, and 3,000 square foot ambulance bay floor.

An innovative energy saving design feature of the facility is a translucent hangar door which allows natural light to enter the hangar during the day, minimizing the use of the photo-sensitive hangar lighting system. Skylights were also designed throughout the building to take advantage of day-lighting and minimize the need for supplemental lighting, although LEDs were installed as well to allow for efficient lighting (as shown in Figure 11-7).

Figure 11-9 Translucent Hangar Door Allows Natural Light to Enter Boston MedFlight's Hangar



Water Efficiency and Wastewater Reduction

In addition to encouraging sustainable and resilient design elements outlined in the SRDSG and supporting the LEED credits for water efficiency and wastewater reduction in new or rehabilitated buildings, Massport continuously seeks opportunities to manage water resources more sustainably at Hanscom Field. Massport has installed low-flow faucets that include automatic water shut-off throughout its facilities, as well as installation of low-flow toilets. Efficient plumbing fixtures and building components at the new ARFF and USCBP facility are expected to reduce water use by 45 percent.

Tenants at Hanscom have also made investments in technologies to improve efficiency of water use. Ross Aviation Rectrix reports utilization of low-flow fixtures in their facility to decrease water consumption. Another tenant incorporated rain sensor technology into the design of their landscape irrigation system, which results in decreased water consumption necessary for

landscaping. Boston MedFlight has incorporated drought-tolerant landscaping to reduce water needs. They also designed water-saving plumbing fixtures into their facility, installing showers, bathroom faucets, kitchen sinks, water closets, and urinals that are more efficient than required by code.

Sustainable Construction Measures

Massport has established requirements for construction contractors that are aimed at minimizing environmental impacts, included in the *Massport Guide to Tenant Construction*. As part of its project approval process, Massport requires contractors to adhere to construction guidelines relating to:

- ⇒ Construction debris and demolition waste recycling;
- ⇒ Selection of high-efficiency space heating/cooling systems;
- ⇒ Manage use of excess construction soil (Soil Management Plan); and
- ⇒ The Clean Construction Initiative, which requires contractors to retrofit their heavy equipment with advanced pollution control devices during construction of all Massport projects.

In addition to enforcing the use of the construction guidelines, Massport actively seeks opportunities to employ environmentally friendly technologies.

Massport seeks to mitigate the impacts of construction projects at Hanscom Field as much as feasible, in order to limit the impact on surrounding communities and neighboring lands. Massport recognizes that construction projects may cause short-term impacts such as increased noise, increased emissions from the exhaust of construction equipment, and fugitive dust generated from earth moving activities. Contractors are recommended to retrofit heavy construction equipment such as front-end loaders, backhoes, cranes and excavators with advanced pollution control devices, such as oxidation catalysts and diesel particulate filters to mitigate emissions impact of construction projects.¹⁸⁰ These devices filter and break down emissions from diesel fuel burn, including hydrocarbons, particulate matters and carbon dioxide. Massachusetts state Anti-Idling law is also

Construction-Period Traffic Management Plans will include the following components:

- ⇒ General project information;
- ⇒ Expected work hours;
- ⇒ Delivery and construction truck routes;
- ⇒ Worker access and parking plans;
- ⇒ Track unloading and staging;
- ⇒ Construction site signs;
- ⇒ Protection of utilities; and
- ⇒ Noise and dust control measures.

¹⁸⁰ Massport Sustainability and Resiliency Design Standards and Guidelines, 2018.

applicable during construction; equipment is not authorized to idle for any longer than five minutes unless it is in active operation.

Control measures are undertaken to mitigate emissions impacts of fugitive dust generated during construction as a result of disturbing dry soil. Fugitive dust emissions are temporarily mitigated through the use of vehicle wash stations and the application of water to exposed soils. Some projects may require long-term mitigation strategies such as seeding or mulching to remove the chance of soil erosion as a result of dry or windy periods.

Prior to any temporary period of construction, Massport will develop a project specific Construction-Period Traffic Management Plan to be published and accessible prior to construction.

The Plans are intended to improve communication with neighboring communities regarding construction projects, in order to reduce impact as much as possible. Plans are provided to the HFAC prior to construction. When feasible, construction will occur on weekdays between 7:00 AM and 7:00 PM, or as consistent with local noise ordinances. In some circumstances, specialized construction activities may be warranted and require work outside this targeted period.

11.5.3 Sustainable Operations and Maintenance

Massport has several programs in place that contribute to the sustainable operation and maintenance of the airport and its facilities. These programs are described below.

Energy Efficiency

In addition to promoting energy efficiency in planning, design, and construction, Massport strives for continuous improvement in operational energy efficiency. At Hanscom Field, digital energy meters were installed to obtain more accurate energy consumption data. The digital energy metering systems provide data necessary for annual reporting and review through the Massport EMS. Hanscom will continue to consider opportunities to re-lamp facilities, airfields, and streetlights with LED systems. In addition, automatic, power-saver light switches will also be evaluated for installation.

Massport is upgrading electrical and fire protection infrastructure at various locations through the airfield as needed. Administrative offices were moved to pre-existing empty office space in the Civil Air Terminal, in order to consolidate resources and decrease the Massport administrative facility foot print.

Clean Fuel Vehicle Programs

As part of the Clean Fuel Vehicle Program, Massport has made progress in bringing alternative fuel vehicles (AFVs) into its fleet at Hanscom Field. At present, Massport owns fifteen fleet vehicles at Hanscom Field, two of which are electric. In addition, several tenants have switched

to electric tugs for moving aircraft, resulting in reduced emissions at the airport. Jet Aviation uses six electric tugs; Signature uses one electric ground service equipment (eGSE) and North Star Facilities owns two electric vehicles. Rectrix maintains four eGSE and two electric fleet vehicles.

Massport will continue to consider AFVs for new vehicle purchase in the future, when appropriate. Any new conventional-fueled vehicle added to the Hanscom fleet in the future will have very low emissions and will automatically comply with the low emission goals of the federal Clean Fuel Fleet Program (40 Code of Federal Regulations Part 88). As part of these regulations, ultra-low-sulfur diesel fuel for on-road diesel vehicles was phased in starting in 2005.

Recycling

Since the 2012 *ESPR*, Massport has continued waste reduction efforts, focusing on single-stream recycling, which enables recycling of a wider range of materials than the previous system. Massport's recycling rate increased by 1.8 percent between 2012 and 2017. Massport also expanded their battery-recycling program in 2017 to include all facilities, recycling 1,250 lbs. of batteries that year alone. In addition, 40 tons of e-waste were recycled Authority-wide between 2012 and 2017.¹⁸¹ Massport aims to increase the recycling rate to 60 percent by 2020.

At Hanscom facilities, scrap metal is recycled in addition to traditional paper, cardboard, metal, plastic and glass. Hanscom and tenant facilities are provided with recycling dumpsters from Massport.

All FBO tenants at Hanscom have a recycling program for some portion of their facility waste, as reported for the 2017 EMS audit. Jet Aviation recycled 68,000 pounds of single stream recycling in 2017. Rectrix recycles one hundred percent of their paper, plastics, cans, glass, and oils. Stream Enterprises collects waste oil, light bulbs, and batteries and recycles them annually. Signature Flight Support recycled over 52,000 pound of plastic, 574,000 pounds of paper, and 10,000 pounds of aluminum.

11.5.4 Climate Adaptation and Resiliency

Since 2012, Massport has increased their Authority-wide focus on climate adaptation and resilience, incorporating a Resiliency Program in 2014, which seeks to integrate resiliency principles, planning, and implementation into all of the authority's business strategies and operations.

Massport completed a climate change risk assessment for the entire organization in 2014 and issued a Floodproofing Design Guideline the next year, providing guidance to enhance the resiliency of critical assets through the use of measures such as temporary flood barriers, flood-

¹⁸¹ Massport. 2018. *Sustainable Massport, Annual Sustainability & Resiliency Report*.

http://www.massport.com/media/2774/massport-annual-sustainability-and-resiliency-report-2018_lr.pdf

resistant doors and hatches, and drainage collection systems or sump pumps. In 2017, Massport reviewed and improved its Flood Operations Plan. Authority-wide climate adaptation and resiliency efforts will be translated to Hanscom Field and other Massport facilities through the EMS framework.

Additionally, Massport has developed a resiliency software application to help prepare for, respond to and recover from severe weather impacts, specifically flood-related damage due to tidal flooding, surge and/or heavy precipitation. The application was developed in response to several Nor'easters that impacted the Greater Boston region during the winter of 2017-2018. This application can be utilized at any Massport facility.

Massport Resiliency Application:

1. Facilitates oversight of heavy precipitation and/or flooding events impacting Massport infrastructure;
 2. Informs decision-making during a flood event where Massport flood operations plans may be or have been activated;
 3. Enables real-time field updates via mobile devices regarding:
 - ⇒ Flood water encroachment;
 - ⇒ Barrier and resource deployments;
 - ⇒ Track unloading and staging;
 - ⇒ Equipment status or activity milestones
- Protection of utilities; and
- ⇒ Site inspections.

Massport recognizes that maintaining and improving facilities at Hanscom is critical to ensuring a viable regional transportation system and for emergency response. At Hanscom, examples of vulnerabilities have arisen including damage of T-hangars during a winter storm in 2014-2015, and flooding in the Civil Air Terminal due to heavy rain in 2017 (See Figure 11-10). The flash flooding resulted in 30 inches of water flooding the first floor of the building, causing \$1.4

Figure 11-10 Flooding at the Civil Air Terminal Facility and Hanscom Field, 9/2017



million in damages. These events underscore the importance of Massport's efforts to evaluate and increase the resiliency of their facilities. Massport plans to develop a more robust resiliency plan for Hanscom in the near future.

Massport has undertaken initiatives to assess the vulnerability of Hanscom assets to climate change impacts, which has informed efforts to strengthen infrastructure at Hanscom. To address flooding risks to the Civil Air Terminal, Massport funded an evaluation of the facility's drainage system and flood proofing enhancements to the building. Recommendations were provided in order to decrease risks from flooding and improve stormwater management practices. Implementation of these recommendations has begun. For example, a new airfield lighting generator was installed in the fall of 2018 that complies with the Floodproofing Design Guidelines.

11.5.5 Regional Economic Contributions

Due to its unique location and facilities, Hanscom provides many economic benefits to its region. Hanscom serves as a vital link to domestic and international destinations for individual pilots, commuter airlines and local employers, including innovative technology corporations, research and development firms, and educational institutions. Businesses look for accessible air travel when deciding where to locate, and Hanscom provides them with easy access to corporate travel opportunities.

The Massachusetts Department of Transportation, Aeronautics Division conducts periodic airport economic impact studies every 3 to 5 years, which includes information concerning the economic impact of regional airports, including Hanscom Field. The most recent study was published in March 2019.¹⁸² It was determined that Hanscom Field activity (excluding military impacts) results in 2,243 jobs. Annual wages for those workers whose employment is directly related to airport activity are nearly \$134 million. Hanscom Field generated estimated economic benefits of approximately \$679 million when direct, indirect, and induced economic benefits of the airport were aggregated. Estimated economic benefits described above do not include economic benefits generated by Hanscom AFB.

11.5.6 Social Sustainability Initiatives

In recognition of the triple bottom line, Massport undertakes a number of partnerships and joint efforts with and for external stakeholders. For Hanscom Field, social sustainability emphasizes good community relations, productive stakeholder engagement, charitable contributions, support for education and youth programs, and environmental efforts that create community benefits. Massport often coordinates efforts with the four towns surrounding Hanscom: Bedford, Concord, Lexington, and Lincoln.

¹⁸² Massachusetts Department of Transportation, *Massachusetts Statewide Airport Economic Impact Study Update*. March 2019. Available at: https://www.mass.gov/files/documents/2019/03/25/AeroEcon_ImpactStudy_January2019.pdf

Hanscom Field's social sustainability initiatives since 2012 include promoting a variety of initiatives focused on bringing benefit to a variety of Massport employees, tenants, and community members. Electronic-waste collection events were held in honor of Earth Day in both 2013 and 2015, providing a forum to prevent hazardous electronic waste from entering landfills. In addition, half of Hanscom's tenants report having an Employee Wellness Program in effect.

Massport invests in a variety of programs to benefit local organizations located in communities that host its facilities, including making charitable contributions and sponsoring scholarships, summer internships, and community summer jobs. The donations and training opportunities are intended to serve a diverse constituency and support a wide variety of worthwhile purposes. For example, in 2017, Massport contributed over \$7,000 to educational, scholarship, and youth programs in the Hanscom area. Additionally, Massport provided approximately \$12,000 to sponsor summer internship positions at various municipal departments in the four towns surrounding Hanscom. They also invested in future leaders by spending over \$14,000 to support the salaries of local college students that worked directly for Massport.

Massport is also focused on increasing public accessibility to the parks and open space near Hanscom. Massport maintains a 40-acre conservation area and local trail network. Massport worked closely with the towns of Bedford and Concord to develop the two-mile trail network and incorporate new trails into existing trail networks at the Mary Putnam Webber Wildlife Preserve and the Dellovo and Vanderhoof conservation areas in Bedford, as well as open space parcels in Concord. The trails allow community members to enjoy their natural surroundings and take advantage of Massport conservation efforts. Massport supports community gardening initiatives through its lease of MPA property to Gaining Ground. Gaining Ground is a non-profit organic farm that grows and donates fresh produce to support regional meal programs and food pantries. Massport also worked closely with the National Park Service to complete a noise outreach program.

In addition, Massport continues updates to its Vegetation Management Plan (VMP) in conjunction with the conservation commissions of the four surrounding towns. This plan ensures that vegetation which grows into Hanscom airspace is managed in an environmentally sensitive manner, with public input. In 2014, the most recent 2014-2018 VMP Update was approved. Obstructions on Hanscom's four runway ends have been mitigated following the recommendations included in the VMP. In 2017, preparation for the 2019-2023 VMP Update began and development continued throughout 2018. The Plan is expected in 2019.

11.6 Environmentally Beneficial Measures

Previous chapters of the *2017 ESPR* have assessed the environmental impacts of Hanscom Field operations for the baseline year of 2017, analyzed historic environmental trends using information from past reports, and considered the potential future effects of operations and development scenarios for future years 2025 and 2035. The *2017 ESPR* future scenarios are used to evaluate the potential cumulative environmental effects that could occur if Hanscom Field reaches the airport activity levels that are described in Chapter 3 Airport Activity Levels.

The aviation activity forecasts that are described in Chapter 3 provide for a realistic and practical level of growth based on local and national aviation trends, including forecasts from the New England Regional Aviation System Plan. The 2025 and 2035 scenarios represent estimates of what could occur in the future, using certain planning assumptions, and are not considered recommended outcomes. This chapter summarizes the environmentally beneficial actions described in previous chapters that are in place at Hanscom Field, as well as additional measures that could be considered to avoid or minimize potential environmental effects.

In accordance with the EEA Scope Certificate, Table 11-2 presents environmentally beneficial measures in place at Hanscom, along with the responsible parties, implementation schedule, and the estimated cost (where applicable and data is available) for each measure. Additional details for each category of measures is described in proceeding subsections.

Table 11-2: Summary of existing and potential future Environmentally Beneficial Measures

Measure Detail	Responsible Party	Timetable	Cost to Implement (Estimate)
GROUND TRANSPORTATION			
Transportation information on Massport website	Massport	Complete	N/A
Transit information in Civil Air Terminal	Massport	Ongoing	Low cost ¹
Participation as a partner in MassRIDES Transportation Management Initiative program	Massport	To be determined	N/A
Information about transit and non-auto travel options in prominent locations throughout Hanscom Field	Massport	Complete	N/A
Bus stop with transit information	Massport	Complete	N/A
Exploration of working with local communities and stakeholders on a bikeshare network	Multiple parties including Massport	No longer active	N/A

Measure Detail	Responsible Party	Timetable	Cost to Implement (Estimate)
NOISE			
Modifications to the Fly Friendly Program using the flight tracking software to direct pilots conducting touch-and-go procedures to fly over the airport instead of neighboring lands or MMNHP, when possible.	Massport	Complete	N/A
Continued implementation of the Fly Friendly program	Massport	Ongoing	Low cost
Run-up procedures for use of the East Ramp	Massport	Ongoing	
Successful relocation of noise monitors based on input from ongoing community coordination process and implementation of updates to the Noise and Operations Monitoring System. Massport now has six monitors at Hanscom, including four in communities off of each runway end and two on the airfield.	Massport	Complete	N/A
Maintaining the interactive online "Airport Activity Monitor", which was released in 2016 and allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance.	Massport	Ongoing	Moderate cost ²
AIR QUALITY			
Continued encouragement of tenants to consider the purchase of alternatively fueled ground service equipment, where appropriate	Massport	Ongoing	Low cost
Encouragement of Fixed Base Operators to minimize Auxiliary Power Unit/Ground Power Unit use	Massport	Ongoing	Low cost
Use of Ultra Low Sulfur Diesel in Massport fleet vehicles	Massport	Ongoing	Low cost
Installation of a paved aircraft holding area at the head of Runway 23 to reduce minor aircraft delays and associated emissions from engine idling	Massport	Complete	N/A

Measure Detail	Responsible Party	Timetable	Cost to Implement (Estimate)
Continued consideration of Alternative Fuel Vehicles for any new Massport vehicle purchase	Massport	Ongoing	Cost varies depending on vehicle number and type
WATER QUALITY			
Support for Shawsheen Watershed Initiative to improve water quality and quantity flow in the Shawsheen River and its tributaries	Massport working with the MassDEP, USEPA, and Hanscom AFB	Ongoing	Moderate cost
Continuation of MassDEP Best Management Practices	Massport	Ongoing	Moderate cost
WILDLIFE			
Manage airfield in a manner that does not disrupt breeding season for grassland birds of which two species are listed under the Massachusetts Endangered Species Act, the Upland Sandpiper and the Grasshopper Sparrow	Massport	Ongoing	Low cost
Continue implementation of all aspects of Wildlife Hazard Management Plan.	Massport	Ongoing	Moderate cost
SUSTAINABLE DEVELOPMENT			
Maintenance of EMS procedures to control environmental effects	Massport	Ongoing	Moderate cost
Notes: 1. Low cost measures < \$5,000 2. Moderate cost measures: \$5,000 - \$50,000 3. High cost measures: >\$50,000			

11.6.1 Ground Transportation

Measures to address ground transportation considerations in the 2025 and 2035 scenarios focus on traffic management and transportation demand management (TDM) approaches, as well as planning efforts to facilitate the development of non-auto modes of travel in the area.

Hanscom Field contributes a small percentage of traffic to Route 2A traffic volumes, just east of Hanscom Drive. The 2017 peak hour volumes represent a slight decrease compared to the 2012 volumes reported in the *2012 ESPR*.

Massport will continue to assess other potential TDM measures (as described in more detail in Chapter 6), such as promotion of ride-sharing and enhancing transit connections that may be appropriate for Hanscom Field. These would also include measures such as updates to Massport's website and other mechanisms to distribute information regarding transportation.

11.6.2 Noise Abatement

Massport has a long history of noise abatement commitments at Hanscom Field, which are based on the 1978 Master Plan and 1980 noise regulations. Massport restricts touch-and-go operations between 11:00 PM and 7:00 AM, the most noise-sensitive time of day, and imposes a fee on operations to discourage nighttime operations. The fee doubles for aircraft that conduct more than five night operations in a calendar year. This nighttime field use fee applies to all aircraft. Massport has added enhancements to implement the Fly Friendly Program, which includes encouraging operators to use noise abatement procedures.

The Hanscom Field Noise Workgroup has developed a number of recommendations which have guided noise abatement efforts at Hanscom Field (recommendations of the Workgroup and status of each are discussed in Chapter 7 Noise and the associated Noise Appendix D). Nearly ninety percent of the recommendations have been implemented or are in the process of implementation. Eight of the fourteen measures were included in the *2005 ESPR* and updated in the *2012 ESPR*. The remaining four recommendations are related to noise monitoring and the correlation of complaints with noise events. These were addressed through updates to the Noise and Operations Monitoring System.

Massport continues to enforce its nighttime run-up noise abatement procedures. Massport directs operators to the run-up pad located due south of Runway 11/29 and west of the intersection with Runway 5/23 during the day. There is a short "blast fence" on the east side of the pad, which deflects jet exhaust, prop wash, and debris. Massport also encourages Fixed Base Operators (FBOs) to minimize the use of auxiliary power units (APUs) and ground power units (GPUs) to minimize noise.

Massport has also worked cooperatively with the local community, aviation groups and the Minute Man National Historical Park (MMNHP) to implement a comprehensive noise abatement program known as "Fly Friendly", guided by the National Business Aircraft Association's (NBAA) published noise abatement guidelines and the Aircraft Owners and Pilots Association (AOPA) noise reduction recommendations. Pilots are encouraged to adhere to safe and quiet flying techniques, and to remain aware of noise issues at the airfield. Additionally, Massport developed recommended helicopter procedures and voluntary touch-and-go procedures that help reduce noise over the MMNHP.

Massport distributes handouts and posters describing noise abatement procedures to tenants, FBOs, and flight training schools. Additionally, all based pilots are required to watch the Massport recommended Fly Friendly procedures video when getting and renewing a security badge.

Massport was an active participant in Sound Initiative, a coalition that successfully supported the federal phase out of Stage 2 aircraft weighing less than 75,000 pounds. Stage 2 aircraft were manufactured before today's stringent noise standards were adopted for new airplanes. The use of Stage 2 aircraft weighing over 75,000 pounds was phased out nationally by 2000, but most of Hanscom's jets weigh less than 75,000 pounds. In 2012, Congress passed the FAA Modernization and Reform Act, which included the phase out of all non-stage 3 aircraft by December 31, 2015. Section 506 of the Act prohibits the operation, within the 48 contiguous states, of jets weighing 75,000 pounds or less that do not comply with Stage 3 noise levels. Military aircraft are exempt from the Stage 3 Rule.

Massport has also launched the interactive online "Airport Activity Monitor" which allows the public to research a noise event or flight, log a noise disturbance, and track correspondence related to a noise disturbance. The Airport Activity Monitor is continuously updated.

Acronyms and Glossary of Terms

Acronyms and Abbreviations

This section provides a list of acronyms and abbreviations that are found in the 2017 *ESPR*. The Glossary of Terms provides definitions for acronyms and abbreviations that have an asterisk (*).

Other		ATCT*	Airport traffic control tower
$\mu\text{g}/\text{m}^3$	micrograms of pollutant per cubic meter		
A		B	
ACI-NA	Airports Council International – North America	BDL	Bradley International, CT airport code
ACRP	Airport Cooperative Research Program	BED	Hanscom Field, MA airport code
AC	Advisory Circular	BGR	Bangor, ME airport code
ADG	Aircraft Design Group	BLSF*	Bordering Land Subject to Flooding
AEDT	Aviation Environmental Design Tool	BOS	(Logan) Boston, MA airport code
AFB*	(Hanscom) Air Force Base	BVT	Burlington, VT airport code
AIP Program	Airport Improvement	BVW*	Bordering Vegetated Wetlands
ALP*	Airport Layout Plan	C	
ALS*	Approach Lighting System	CAA	Clean Air Act; Connecticut Airport Authority
APU*	Auxiliary Power Unit	(US)CBP	U.S. Customs and Border Protection
ARFF	Airport Rescue and Fire Fighting	CEP	Comprehensive Energy Plan
ARTS*	Automated Radar Terminal System	CEQ	Council on Environmental Quality
ASR*	Airport Surveillance Radar	CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
AST	Aboveground Storage Tanks		
ATC*	Air route traffic control center		



CGP	Construction General Permit	ENF*	Environmental Notification Form
CH ₄	Methane	EOEEA	Executive Office of Energy and Environmental Affairs
CIP	Capital Improvement Plan	EOT	Executive Office of Transportation
CMR	Code of Massachusetts Regulations	EPA	(U.S.) Environmental Protection Agency
CMS*	Congestion Management System	ESA	Endangered Species Act
CO*	Carbon monoxide	EXP*	Total Noise Exposure
CO ₂	Carbon dioxide	F	
CWA	Clean Water Act	FAA	Federal Aviation Administration
D		FAR	Federal Aviation Regulation
dB*	Decibel	FBO*	Fixed Base Operator
dBA*	A-weighted decibel	FEMA	Federal Emergency Management Agency
DEP	Department of Environmental Protection	FHWA	Federal Highway Administration
DME	Distance Measuring Equipment	FICAN	Federal Interagency Committee on Aviation Noise
DNL*	Day-Night Sound Level	FICON	Federal Interagency Committee on Noise
DoD	Department of Defense	FIRM*	Flood Insurance Rate Map
DOT	(U.S.) Department of Transportation	FONSI*	Finding of No Significant Impact
E		FY	Fiscal Year
EA*	Environmental Assessment	G	
EDMS*	Emissions and Dispersion Modeling System	GA	General Aviation
eGSE	electric Ground Service Equipment	GEIR*	Generic Environmental Impact Report
EIR*	Environmental Impact Report	GHG	Greenhouse Gas(es)
EIS*	Environmental Impact Statement		
EMS*	Environmental Management System		

GIS	Geographic Information Systems	ISO	International Organization for Standardization
gpd	gallons per day	JCA	Jordan Conservation Area
gpm	gallons per minute	K	
GPU*	Ground Power Unit	kWh	kilowatt-hours
GS*	Glide Slope	L	
GSA	General Services Administration	LEED*	Leadership in Energy and Environmental Design
GSE*	Ground Service Equipment	L _{eq} *	Equivalent Sound Level
GWSA	Massachusetts Global Warming Solutions Act	LEV / ZEV*	Low Emissions Vehicle / Zero Emissions Vehicle
H		LID	Low Impact Development
HATS*	Hanscom Area Towns Committee	LOC*	Localizer antenna
HFAC*	Hanscom Field Advisory Commission	LOS*	Level of Service
HIRL*	High Intensity Runway Lighting System	LSP*	Licensed State Professional
HOV*	High Occupancy Vehicle	LTO*	Landing and Takeoff
HVN	Tweed New Haven, CT airport code	LUWB*	Land under Water Bodies/ Waterways
Hz*	Hertz	M	
I-J		M.G.L.	Massachusetts General Laws
ICAO	International Civil Aviation Organization	MAAQS	Massachusetts Ambient Air Quality Standards
IFR*	Instrument Flight Rule	MACRIS*	Massachusetts Cultural Resources Information System
ILS*	Instrument Landing System	MAGIC	Minuteman Advisory Group on Interlocal Coordination
ILSF*	Isolated Land Subject to Flooding	MALSR*	Medium Intensity Approach Lighting System and Runway Alignment Indicator Lights
INM*	Integrated Noise Model	MAPC	Metropolitan Area Planning Council
IRP*	Installation Restoration Program	MassDEP	Massachusetts Department of Environmental Protection
		MassDOT	Massachusetts Department of Transportation
		Massport	Massachusetts Port Authority



MBTA	Massachusetts Bay Transportation Authority	MWRC	Merrimack River Watershed Council
MCAA	Massachusetts Clean Air Act	N	
MCL	Maximum Contaminant Levels	NAAQS*	National Ambient Air Quality Standards
MCP*	Massachusetts Contingency Plan	NASA	National Aeronautics and Space Administration
MDAR	Massachusetts Department Agricultural Resources	NAVAID*	Navigational Aid
MEP	Multi-Engine Piston	NBAA	National Business Aviation Association
MEPA*	Massachusetts Environmental Policy Act	NDB*	Non-Directional Beacon
MESA*	Massachusetts Endangered Species Act	NEPA*	National Environmental Policy Act of 1969
MHC*	Massachusetts Historic Commission	NERASP*	New England Regional Airport System Plan
MHT	Manchester-Boston, NH airport code	NHESP*	Natural Heritage and Endangered Species Program
MIRL*	Medium Intensity Runway Lighting System	NHTSA	National Highway Traffic Safety Administration
MIT	Massachusetts Institute of Technology	NO ₂ *	Nitrogen dioxide
MMNHP*	Minute Man National Historical Park	NOI*	Notice of Intent
MMT	Million Metric Tons	NOMS*	Noise and Operations Monitoring System
MOA	Memorandum of Agreement	NO _x *	Nitrogen oxides
MOVES*	Motor Vehicle Emission Simulator	NPDES	National Pollutant Discharge Elimination System
MPO	Metropolitan Planning Organization	NPIAS	National Plan of Integrated Airport Systems
mph	miles per hour	NPL*	National Priority List
MSASP	Massachusetts Statewide Airport System Plan (MSASP)	NPS	National Park Service
MSGP	Multi-Sector General Permit	NRCS	Natural Resource Conservation Service
MT	Metric tons	NWIRP	Naval Weapons Industrial Reserve Plant
MW*	Megawatt	O	
MWRA	Massachusetts Water Resources Authority	O ₃ *	Ozone
		OFA*	Object Free Area

OFZ*	Object Free Zone	ROD*	Record of Decision
OpsSpecs	Operations Specifications	RPZ*	Runway Protection Zone
ORH	Worcester, MA airport code	RSA*	Runway Safety Area
ORW*	Outstanding Resource Water	RTN	Release Tracking Number
OU*	Operable Unit	RVR*	Runway visual range
P-Q		S	
PAPI*	Precision Approach Path Indicators	SAGA	Sustainable Aviation Guidance Alliance
PAR*	Precision Approach Radar	SDSG	Sustainable Design Standards and Guidelines
Pb	Lead	SEL	Sound Exposure Level
PCB*	Polychlorinated biphenyl	SEP	Single Engine Piston
PM*	Particulate matter (e.g., PM10, PM2.5)	SFTA	Southern Flight Test Area
ppm	parts per million	SIP*	State Implementation Plan
psi	pounds per square inch	SMP	Sustainability Management Plan
PSM	Portsmouth, NH airport code	SO ₂ *	Sulfur dioxide
PV	Photovoltaic	SOV	Single Occupancy Vehicle
PVD	T.F. Green, RI airport code	SPCC*	Spill Prevention Control and Countermeasure Plan
PWM	Portland, ME airport code	SSALR*	Simplified Short Approach Light System
R		SWPPP*	Stormwater Pollution Prevention Plan
RACT*	Reasonably Available Control Technology	T	
RAIL*	Runway Alignment Indicator Lights	TA*	Time Above
RAO*	Response Action Outcome	TAF	Terminal Area Forecast
RCRA	Resource Conservation and Recovery Act	TACAN*	Tactical Air Navigation
RDA*	Request for Determination of Applicability	TCE*	Trichloroethylene
REIL*	Runway end identifier light	TDM*	Transportation Demand Management
RIAC	Rhode Island Airport Corporation	TERPS*	Terminal Instrument Procedures
RIDOT	Rhode Island Department of Transportation	TIA	Traffic Impact Assessment
		TIM*	Time-in-mode



TIP*	Transportation Improvement Plan	USFWS	U.S. Fish and Wildlife Service
TL*	Taxilane	USGS	United States Geological Survey
TMA*	Transportation Management Association	V	
TMDL	Total Maximum Daily Loads	v/c	Volume-to-capacity
TMI*	Transportation Management Initiative	VALE	Voluntary Airport Low Emissions Program
TPH*	Total petroleum hydrocarbon	VASI*	Visual Approach Slope Indicators
TRACON*	Terminal Radar Approach Control	VFR*	Visual Flight Rules
TRB	Transportation Research Board	VMA	Vegetation Management Area
TSA*	Transportation Security Administration; Taxiway Safety Area; Traffic Study Areas	VMP*	Vegetation Management Plan
TSS*	Total suspended solids	VMT*	Vehicle Miles Traveled
TW*	Taxiway	VOC*	Volatile Organic Compounds
U		VPD	Vehicles Per Day
UFP	Ultrafine Particles	VOR*	Very-High-Frequency Omni-directional Range (aviation); Vehicle Occupancy Rate (ground transportation)
USACE	U.S. Army Corps of Engineers	W-Y	
USAF	U.S. Air Force	WPA*	Wetland Protection Act (MA)
USC	United States Code	Z	
USDA	United States Department of Agriculture	ZEV*	Zero Emissions Vehicle
USGBC	U.S. Green Building Council		
UST	Underground Storage Tank		

Glossary of Terms

A

A-weighted sound level (dBA) – An adjustment to the very high and very low frequencies to approximate the human ear's reduced sensitivity to those frequencies. This adjustment is used to account for frequency dependence in measuring community noise. Customarily referred to simply as "sound levels" where the adjective "A-weighted" has been omitted. With A-weighting, a noise source having a higher sound level than another is generally perceived as louder. Also, the minimum change in sound level that people can detect outside of a laboratory environment is on the order of three decibels (dB). A change in sound level of ten dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relationship holds true for loud sounds as well as for quieter sounds.

Air Route Traffic Control Center (ATC) - A facility established to provide air traffic control service to aircraft operating on Instrument Flight Rules (IFR) flight plans within controlled airspace and principally during the enroute phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to Visual Flight Rules (VFR) aircraft.

Airport Traffic Control Tower (ATCT) – The air traffic control unit responsible for controlling movements around an airport as well as the name of the building in which the unit operates. The height of permanent ATCT structures gives air traffic controllers

visual contact with aircraft on the ground and in the air around an airport. The ATCT facility, operated by appropriate authority at an airport, promotes the safe, orderly and expeditious flow of air traffic within the airport traffic area.

Airport Layout Plan (ALP) – A scaled drawing of existing and proposed land and facilities necessary for the operation and development of the airport.

Airport Lighting – Various lighting aids that may be installed on an airport. Types of airport lighting include:

1. **Approach Light System (ALS)** – An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach for landing. Condenser-Discharge Sequential Flashing Lights/Sequenced Flashing Lights may be installed in conjunction with the ALS at some airports. Types of ALS at the Airport are Simplified Short Approach Light System (SSALR) with Runway Alignment Indicator Lights (RAIL).
2. **Runway Lights/Runway Edge Lights** – Lights having a prescribed angle of emission used to define the lateral limits of a runway. Runway lights are uniformly spaced at intervals of approximately 200 feet, and the intensity may be controlled or preset.
3. **Runway Centerline Lighting** – Flush centerline lights spaced at 50-foot intervals

beginning 75 feet of the opposite end of the runway.

4. **Runway End Identifier Lights (REIL)** – Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.
5. **Visual Approach Slope Indicator (VASI)** – An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is "on path" if he sees red/white, "above path" if white/white, and "below path" if red/red. Some airports serving large aircraft have three-bar VASIs which provide two visual glide paths to the same runway.

Airport Marking Aids – Markings used on runway and taxiway surfaces to identify a specific runway, a runway threshold, a centerline, a hold line, etc. A runway should be marked in accordance with its present usage such as:

- Visual
- Non-precision instrument
- Precision instrument

Airport Reference Point (ARP) – The latitude and longitude of the approximate center of the airport.

Airport Rotating Beacon (ARB) – A visual NAVAID operated at many airports. At civil airports, alternating white and green flashed lights indicate the location of the airport. At military airports, the beacons flash alternatively white and green, but are

differentiated from civil beacons by dual peaked (two quick) white flashes between the green flashes.

Airport Surveillance Radar (ASR) – Approach control radar used to detect and display an aircraft's position in the terminal area. ASR provides range and azimuth information but does not provide elevation data. Coverage of the ASR can extend up to 60 miles, presenting air traffic controllers with the location of all aircraft within the range of the antenna.

Approach Control Facility – A terminal Air Route Traffic Control Center facility that provides approach control service in a terminal area.

Approach Light System (ALS) – See Airport Lighting.

Apron – A defined area on an airport or heliport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance. With regard to seaplanes, a ramp is used for access to the apron from the water.

Automated Radar Terminal System (ARTS) – A range of systems that display for the terminal controller aircraft identification, flight plan data, other flight associated information such as altitude, speed, and aircraft position.

Auxiliary Power Unit (APU) – Self-contained generator on an aircraft that provides electricity, heat and air conditioning to an aircraft when its engines are off.

Aviation Environmental Design Tool (AEDT) – A software program developed and used by the FAA to model aircraft

performance to model fuel burn, air emissions and noise.

B

Banks – Land areas that normally abut and confine a water body. Banks occur between a waterbody and a vegetated wetland or adjacent floodplain, or between a waterbody and an upland.

Base Realignment and Closure (BRAC) – A process used by the U.S. Department of Defense to close military bases and realign assets to improve efficiency and reduce cost. BRAC processes have occurred in 1989, 1991, 1993, 1995 and 2005.

Below Minimums – Weather conditions below the minimums prescribed by regulation for the particular action involved; e.g., landing minimums, takeoff minimums.

Bordering Land Subject to Flooding (BLSF) – The maximum lateral extent of floodwater, which will theoretically result from the statistical 100-year storm. The extent of Bordering Land Subject to Flooding is typically derived from examining FEMA Flood Insurance Rate Maps.

Bordering Vegetated Wetlands (BVW) – Vegetated areas that border on water bodies and waterways including vegetated freshwater wetlands. The technical criteria and methodology utilized to identify and delineate BVW is set forth in Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act (DEP, 1995). Criteria for identifying and delineating this resource area include the presence of a plant community dominated by wetland indicator species, and signs of

hydrology. The presence of hydric soils within the wetland is considered an indicator of hydrology.

C

Carbon Monoxide (CO) – A regulated air pollutant created from the combustion of fossil fuel.

Ceiling – The heights above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obscuration," and not classified as "thin" or "partial."

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – A federal law enacted by Congress on December 11, 1980, that provides federal authority to respond to releases or threatened releases of hazardous substances that may endanger public health or the environment (also known as the Superfund Act). CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and, established a trust fund to provide for cleanup when no responsible party could be identified. The trust fund is funded by taxes on the chemical and petroleum industries.

Controlled Airspace - Airspace designated as a control zone, airport radar service area, terminal control area, transition area, control area, continental control area, and positive control area within which some or all aircraft may be subject to air traffic control.

D



Day-Night Average Sound Level (DNL) – DNL is the FAA’s primary metric for measuring aircraft noise and exposure. DNL is a metric that represents the total accumulation of all sound energy spread out over a 24-hour period, on an average annual basis. DNL includes a 10-decibel penalty for nighttime noise (between 10pm and 7am).

Decibel (dB) – A logarithmic unit that is used to represent the intensity of sound. This representation is called a sound pressure level. A sound pressure level of less than 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet conditions. Normal conversational speech has a sound pressure level of approximately 60 to 65 dB. Sound pressure levels above 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Decision Height – With respect to the operation of aircraft, means the height at which a decision must be made during an Instrument Landing System or instrument approach to either continue the approach or to execute a missed approach.

Departure Control – A function of an approach control facility providing air traffic control service for departing IFR and, under certain conditions, Visual Flight Rules aircraft.

E

Emissions and Dispersion Modelling System (EDMS) - Computer program established by the Federal Aviation Administration (FAA) to calculate emissions and dispersion of aircraft operations at an airport. The latest version is 4.3.

Enroute Air Traffic Control Services – Air traffic control service provided aircraft on Instrument Flight Rules flight plans, generally by centers, when these aircraft are operating between departure and destination terminal areas. When equipment, capabilities, and controller work load permit, certain advisory/assistance services may be provided to VFR aircraft.

Environmental Assessment (EA) – An environmental document filed in accordance with the National Environmental Policy Act of 1969 that documents the environmental impacts of a proposed action in support of a Finding of No Significant Impact (FONSI) or the facilitation of the preparation of an Environmental Impact Statement (EIS). An EA and its FONSI document NEPA compliance. The EA process includes public review and comment on its scope and filing.

Environmental Impact Report (EIR) – An environmental document filed in accordance with the Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive, to study the environmental consequences of a project. Typically, the proponent files a draft and final EIR, but the Secretary of Environmental Affairs may allow a single EIR. The EIR process includes public review and comment on its scope and filings, which are noticed in the Environmental Monitor. At the close of the EIR review period, the Secretary decides whether the EIR is adequate and issues an Adequacy determination that includes enforceable mitigation commitments.

Environmental Impact Study (EIS) – An environmental document filed in

accordance with the National Environmental Policy Act of 1969 that documents the environmental impacts of a proposed action that has significant environmental impacts. An EIS describes a proposed action, its purpose and need, alternatives to the proposed action, the affected environment, and an environmental analysis of each alternative. The EIS process includes public review and comment on its scope and filing.

Environmental Management System (EMS) – A system instituted by Massport to help evaluate and mitigate the environmental impacts from airport operations and planning.

Environmental Notification Form (ENF) – An environmental document filed in accordance with the Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive, to begin the MEPA review process. A proponent begins the ENF process if a project is subject to MEPA jurisdiction and either it meets or exceeds one or more review thresholds or the Secretary of Environmental Affairs requires fail-safe review. The ENF process includes public review and comment on its scope and filing, which are noticed in the Environmental Monitor, and a MEPA Consultation session. At the close of the review period for an ENF, the Secretary issues an Adequacy Determination that may require an EIR or allow the proponent to take action on the project.

Equivalent Sound Level (L_{eq}) – A measure of exposure resulting from the accumulation of A-weighted sound levels over a particular period (as opposed to an event) of interest such as an hour, an eight-

hour school day, nighttime, a single 24-hour period, or an average 24-hour period. Because the length of the period can differ, the applicable period should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example L_{eq} (8) or L_{eq} (24). Conceptually, the L_{eq} may be thought of as the constant sound level occurring over the designated period of interest and having as much sound energy as that created by the actual rising and falling sound pressures from multiple noise sources as they become more or less pronounced.

F

FAA Aircraft Engine Emissions Database (FAEED) - A computerized emissions inventory calculation procedure that contains air pollution emissions information for various aircraft engines and data correlating engines to specific aircraft. The emissions data from FAEED have been incorporated into the EDMS.

Federal Motor Vehicle Control Program (FMVCP) – Air pollution emission standards for new motor vehicles that have been established by the U. S. EPA. These standards have mandated increasing strict air pollution emission factors for motor vehicles.

Final Approach – That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified,

1. at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or



2. at the point of interception of the last track specified in the approach procedure; and ends at a point in the vicinity of an aerodrome from which: a) a landing can be made; or b) a missed approach procedure is initiated.

Final Approach Fix (FAF) – The fix from which the final approach (IFR) to an airport is executed and which identifies the beginning of the final approach segment. When ATC directs a lower-than-published Glide Slope/path Intercept Altitude, it is the resultant actual point of the glide slope/path intercept.

Final Approach Point (FAP) – The point, applicable only to a non-precision approach with on depicted Final Approach Fix such as on-airport Very-High-Frequency OmniRange (VOR), where the aircraft is established inbound on the final approach course from the procedure turn and where the final approach descent may be commenced. The FAP serves as the FAF and identifies the beginning of the final approach segment.

Fixed Base Operator (FBO) – A full-service FBO is a company that handles a range of needs for based and transient aircraft, their operators, and their passengers. These include cleaning, maintaining, fueling and parking/ hanging aircraft; providing flight planning services for pilots; and arranging for the specific needs of those flying, such as ground transportation or overnight accommodations. Although the majority of FBO activity involves servicing corporate general aviation activity, the FBOs also provide some charter activity.

Flood Insurance Rate Map (FIRM) – A map that is published by the Federal Emergency Management Agency to determine flood

insurance requirements and to assist communities in regulating new development. Flood Insurance Rate Maps show areas that have a one percent chance of flooding (the 100-year floodplain) and a 0.2 percent chance of flooding in any given year (the 500-year floodplain). These areas are determined to be the areas of highest risk when a stream overflows its banks or when coastal waters experience tidal surges from tropical storms or hurricanes.

G

General Aviation – That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of public convenience and necessity from the Civil Aeronautics Board and large aircraft commercial operators.

General Aviation Revitalization Act (GARA) – Legislation that amends the Federal Aviation Act of 1958 to establish time limitations on certain civil actions against aircraft manufacturers.

General Management Plan (GMP) – Broad and comprehensive, long-term planning documents prepared by National Park Service for each National Park, which typically encompasses preservation of natural and cultural resources, visitor use and interpretation, roads, and facilities.

Generic Environmental Impact Report (GEIR) – An environmental filing to the Executive Office of Environmental Affairs that assesses the environmental effects of policies or plans as opposed to site-specific projects.

Glide Slope (GS) – Provides vertical guidance for aircraft during approach and landing. The glideslope / glide path is

based on the following: (1) electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as Instrument Landing System, or: (2) Visual ground aids which provide vertical guidance for Visual Flight Rules approach or for the visual portion of an instrument approach and landing.

Ground Power Unit (GPU) – Generator on the ground that provides electricity, heat and air conditioning to an aircraft when its engines are off.

H

Hanscom Air Force Base (AFB) – A 396-acre United States Air Force Base in Bedford, Concord, Lexington and Lincoln that supports the Electronic Systems Center of the Air Force Material Command.

Hanscom Area Towns (HATS) – The Growth and Development Policy Committee established under M.G.L. Chapter 40 Section 4I to address intergovernmental and planning issues in Bedford, Concord, Lexington and Lincoln.

Hanscom Field Advisory Commission (HFAC) – An advisory commission that was established by act of the State legislature in 1980. HFAC includes 16 members appointed by the selectmen of Bedford, Concord, Lexington and Lincoln. HFAC includes representatives from the Town of Bedford, Concord, Lexington and Lincoln; local citizens groups; other area towns affected by Hanscom Field; businesses basing aircraft at Hanscom Field; aviation or aviation-related businesses at Hanscom Field; and business-aviation general aviation organizations.

Hanscom Noise Workgroup – A group of community- and aviation-based members that was organized by Massport at the request of the Secretary of Environmental Affairs after the filing of the *1995 GEIR* in 1997. The HNWG met for a period of two years and published its findings in a report entitled "Report of the Hanscom Field Noise Workgroup," dated September 22, 1999. Their report summarizes the series of meetings by the committee and its two task groups, one devoted to abatement and mitigation, the other to metrics and modeling.

Hertz (Hz) – International System of Units measure for the number of times that a repeated event occurs during a specified unit of time.

High Occupancy Vehicle (HOV) – A vehicle carrying two or more passengers.

High Intensity Runway Lighting System (HIRLS) – A system of high intensity lights that outline edges of runways during periods of darkness or restricted visibility conditions.

I-J

Initial Approach Fix – The fixes depicted on instrument approach procedure charts that identify the beginning of the initial approach segments.

Installation Restoration Program (IRP) - A program within the DERP that focuses on releases of hazardous substances, pollutants, or contaminants that pose environmental health and safety risks.

Instrument Approach Procedure – A series of predetermined maneuvers for the orderly transfer of an aircraft under



instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is prescribed and approved for a specific airport by competent authority.

Instrument Flight Rules (IFR) – Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

Instrument Landing System (ILS) – A precision instrument approach system which normally consists of the following electronic components and visual aids:

- Localizer
- Glide slope
- Outer Marker
- Middle Marker
- Approach Lights

Instrument Meteorological Conditions - Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

Instrument Runway - A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach having straight-in landing minimums has been approved.

Integrated Noise Model (INM) – A complex computer program that calculates aircraft noise levels around an airport from user input data and an extensive internal database of aircraft noise and performance statistics. Outputs can include DNL contours and other metrics such as Time Above and DNL values at specific points.

The FAA developed the INM as the primary tool for analyzing and evaluating noise impacts from aircraft operations. Its use used to be prescribed for all FAA-sponsored projects requiring environmental evaluation; however INM has been replaced by AEDT.

Inventory of the Historic and Archaeological Assets of the Commonwealth – An inventory of historic properties and archaeological sites maintained by the Massachusetts Historical Commission.

Isolated Land Subject to Flooding (ILSF) – Isolated depressions or closed basins without an inlet or outlet. It is an area which, at least once per year, confines standing water to a volume of at least one-quarter acre-feet and an average depth of at least six inches.

K

Kilovolt (kV) - Initial Approach Fix – A unit of measure equal to 1,000 volts that is commonly used to describe the potential power of an electrical distribution system.

Kilovolt ampere (kVA) – A unit of measure equal to 1,000 volt amperes that is commonly used to describe the capacity of an electrical transformer.

L

L.G. Hanscom Field - Approximately 1,300-acre civilian airport in Bedford, Concord, Lexington, and Lincoln and operated by the Massachusetts Port Authority.

Landing Minimums – The minimum visibility prescribed for landing a civil aircraft while using an instrument approach procedure. Descent below the established

or Decision Height is not authorized during an approach unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and adequate visual reference to required visual cues is maintained.

Land Under Water Bodies/Waterways (LUWB) – The land area under any creek, river, stream, pond or lake is a resource area subject to protection under the Massachusetts Wetlands Protection Act.

Landing-Takeoff Cycle (LTO) – Aircraft operations performed at airports. The Landing-Takeoff Cycle includes: approach from a level of 3,000 feet above ground level, landing, taxi-in, taxi-out, takeoff, and climb-out to a height of 3,000 feet above ground level.

Large Airplane – An airplane of more than 12,500 pounds (5,700 kg) maximum certificated takeoff weight.

Leadership in Energy and Environmental Design (LEED) – The U.S. Green Building Council established the LEED Green Building Rating System® as a “voluntary, consensus-based national standard for developing high-performance, sustainable buildings.” A rating system is used to determine four levels of LEED certification with Platinum being the highest level.

Level of Service (LOS) – Level of service is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. It is an aggregate measure of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway system capacity to roadway system travel demand. Operating level of service is reported on a scale of A to F, with

A representing the best operating conditions and F representing the worst operating conditions. LOS A represents uncongested conditions with little or no delay to motorists, while LOS F represents a forced-flow condition with delays and traffic demands that have been identified as exceeding roadway capacity. Roadway operating levels of service are calculated following procedures defined in the *2000 Highway Capacity Manual (HCM)*, published by the Transportation Research Board (TRB) for signalized and unsignalized intersections.

Licensed Site Professional (LSP) – The Massachusetts DEP has developed a licensing procedure for consultants working in the context of the MCP, consisting of testing and training requirements to assure a base level of competency. Those consultants meeting DEP requirements become LSPs and provide assistance to disposal site owners to assure the site is cleaned up following the MCP process. The LSP minimizes DEP involvement in site activities by overseeing actions conducted at the site.

Localizer (LOC) – The component of an ILS that provides course guidance to the runway, emitting a signal used to establish and maintain an aircraft’s horizontal position until visual contact confirms the runway alignment and location.

Localizer Type Directional Aid (LDA) – A navigational aid used for nonprecision instrument approaches with utility and accuracy comparable to a localizer but which is not a part of a complete ILS and is not aligned with the runway.



Low Emissions Vehicle (LEV) – Motor vehicles that meet air pollution emission standards that are more-strict (lower) than those that are required for vehicles under the FMVCP.

M

Massachusetts and National Ambient Air Quality Standards (NAAQS) - Air pollutant concentrations for defined periods of time (1-hour, 24-hours, annual, etc.) established to protect the public's health and welfare in ambient (outdoor) air.

Massachusetts Contingency Plan (MCP) – A regulatory framework for cleaning up hazardous waste sites in Massachusetts. The MCP outlines the schedule and procedures to be followed at disposal sites to undertake necessary and appropriate response actions to provide protection of health, safety, public welfare and the environment. The MCP regulatory citation is 310 CMR 40.0000.

Massachusetts Cultural Resources Information System (MACRIS) – A computerized database listing of the Inventory of the Historic and Archaeological Assets of the Commonwealth that can be linked to MassGIS. MACRIS is maintained by the Massachusetts Historical Commission (MHC).

The Massachusetts Endangered Species Act (MESA) – The Massachusetts Endangered Species Act that was enacted in December 1990 to protect plant and animal species in danger of extinction. Implementing regulations were promulgated in 1992 and recently revised and implemented as of July 1, 2005. The

regulation requires habitat alteration permits for projects that may alter a significant portion of habitat. The recent revisions clarify filing requirements, implement fees, and specify time lines for the regulatory review process.

Massachusetts Environmental Policy Act (MEPA) – The Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive. The Massachusetts Environmental Policy Act requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. It also requires them to take all feasible measures to avoid, minimize, and mitigate damage to the environment. MEPA further requires that state agencies "use all practicable means and measures to minimize damage to the environment," by studying alternatives to the proposed project, and developing enforceable mitigation commitments, which will become permit conditions for the project if and when it is permitted.

Massachusetts Environmental Policy Act (MEPA) Office – The MEPA Office is the staff of the Secretary of Environmental Affairs responsible for implementation and administration of the MEPA review process. The staff, headed by the Assistant Secretary for Environmental Impact Review (also known as the MEPA Director), consists of environmental analysts and administrative support staff. The MEPA Office reviews ENF, EIR, Notice of Project Change (NPC), and ESPR filings; makes recommendations to the Secretary regarding the adequacy of these filings and the need for additional filings; assists project proponents, agencies, and the public with questions;

interprets the MEPA regulations; publishes the Environmental Monitor and review schedule.

Massachusetts Historical Commission (MHC) – Established in 1983 to encourage preservation of the rich cultural heritage of the Commonwealth's cities and towns. The MHC is the State Historic Preservation Office.

Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) – A configuration of medium-intensity lights with Runway Alignment Indicator Lights positioned symmetrically along the extended runway centerline to provide visual lighting guidance for landing aircraft. A MALSR supports Category I precision approaches.

Medium Intensity Runway Lighting System (MIRLS) – A system of medium intensity lights that define the lateral limits of runways during periods of darkness or restricted visibility conditions.

Mesoscale air quality analysis – analysis and calculation of air emissions over a larger area, in comparison to a microscale analysis which focuses on smaller areas (e.g. an intersection).

Middle Marker – A marker beacon that defines a point along the glide slope of an Instrument Landing System normally space located at or near the point of decision height (Instrument Landing System Category I). It is keyed to transmit alternate dots and dashes, with the alternate dots and dashes keyed at the rate of 95 dot/dash combinations per minute on a 1300 Hz tone, which is received aurally and visually by compatible airborne equipment.

Minimums – Weather condition requirements established for a particular operation or type of operation; e.g., IFR takeoff or landing, alternate airport for Instrument Flight Rules flight plans, Visual Flight Rules flight, etc.

Minute Man National Historical Park (MMNHP) – The National Park Service operates the Minute Man National Historical Park, which was created in 1959. The park consists of three discontinuous sections referred to as the Battle Road, Wayside, and North Bridge Units and covers approximately 967 acres along Route 2A in Concord, Lexington, and Lincoln and off Monument Street in Concord. Minute Man National Historical Park itself and a number of individual historic properties within the park are historic resources of national significance that are designated National Historic Landmarks. The park is nationally significant as the site of the Battle of Concord, one of the two battles that marked the beginning of the Revolutionary War; for its association with prominent literary figures of the nineteenth and twentieth centuries; and as one of the earliest places in the nation to be commemorated. The park was created to " . . . provide . . . for the preservation and interpretation of historic sites, structures, and properties lying along the entire route of battle" in April 1775.

MOVES – U. S. Environmental Protection Agency system to estimate and model the emission of criteria air pollutants, greenhouse gases and other air toxics from the operation of mobile sources (cars, trucks, buses, etc.).



Movement Area – The runways, taxiways, and other areas of an airport/heliport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with a tower, specific approval for entry onto the movement area must be obtained from Air Route Traffic Control Center.

N

National Ambient Air Quality Standards (NAAQS) - Air pollution concentrations in outdoor air that have been established by the EPA to protect the public's health and welfare. NAAQS are air pollution concentrations that may not be exceeded.

National Environmental Policy Act (NEPA) of 1969 –An Act that established the national policy for the environment and created the Council on Environmental Quality. NEPA requires that an Environmental Impact Statement or EIS be prepared on every "major federal action" undertaken or permitted. A Finding of No Significant Impact (FONSI) is issued if it is determined that the project will not have a significant effect on the environment. An EIS must consider alternatives and mitigation measures that would lessen the project's impacts. The EIS must be made available in draft form for public comment and the agency must respond to those comments received in the Final EIS.

Natural Heritage and Endangered Species Program (NHESP) – Part of the Massachusetts Division of Fisheries and Wildlife that is responsible for the conservation and protection of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the

state. The highest priority of NHESP is protecting the approximately 190 species of vertebrate and invertebrate animals and 258 species of native plants that are officially listed as Endangered, Threatened or of Special Concern in Massachusetts. A primary responsibility of the NHESP is the regulatory protection of rare species and their habitats as codified under the MESA (M.G.L. c.131A) and Wetlands Protection Act (M.G.L. c.131s.40).

National Pollutant Discharge Elimination System (NPDES) – A program authorized under the U.S. Clean Water Act to control water pollution by regulating point sources (e.g., pipes, ditches, conduits) that discharge pollutants into waters of the United States. NPDES permits are administered by U.S. EPA or delegated to individual states to administer. General and Individual NPDES permits are typically five years in length and have provisions for automatic extensions if the permit is not reissued prior to expiration. In Massachusetts this program is administered by the EPA.

National Priority List (NPL) – List of hazardous waste sites eligible for long-term remedial action financed under the federal Superfund program.

Navigational Aid (NAVAID) – Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight.

New England Regional Aviation System Plan (NERASP) – A joint effort by the FAA, Massport and the Massachusetts Aeronautics Commission with the involvement of major commercial service

airports throughout the six-state region. The NERASP developed forecasts from a regional perspective rather than from the perspective of an individual airport or a state system of airports. Each airport's potential to accommodate scheduled commercial passenger was based not only on the demand generated by the airport's catchment area, but also considered the attractiveness of nearby airports that passengers may also utilize.

Nitrogen dioxide (NO₂) – One of the Oxides of Nitrogen (NO_x) compounds. The U. S. EPA has established regulations, including a NAAQS, for nitrogen dioxide (NO₂).

Noise and Operations Monitoring System (NOMS) – A system of six permanent noise monitors near Hanscom Field and the software that is used to monitor their operation. The system was installed in 1989 and is in the process of being upgraded by Massport.

Noise Sensitive Receptor – Site-specific location where noise exposure may be a concern. The ESPR calculates DNL and Time Above values at the following types of noise sensitive receptors: hospitals, sites on the National Register of Historic Places, public facilities, religious sites, and schools.

Nondirectional Beacon (NDB) – A Low/Medium Frequency or Ultra High Frequency radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his bearing to or from the radio beacon and "home" on or track to or from the station. When the radio beacon is installed in conjunction with the

Instrument Landing System marker, it is normally called a Compass Locator.

Nonmovement Area – Taxiways and apron (ramp) areas not under the control of air traffic.

Nonprecision Approach Procedure – A standard instrument approach procedure in which no electronic glideslope is provided; e.g., VHF Omnidirectional Range (VOR), Tactical Aircraft Control and Navigation (TACAN), NDB, LOC, ASR, LDA, or Simplified Direction Finding (SDF) approaches.

Notice of Intent (NOI) – A filing with the Conservation Commission of a local jurisdiction that uses WPA Form 3 or, in limited circumstances WPA Form 4 (Abbreviated Notice of Intent), to seek confirmation of delineated wetland resource area boundaries

Notice of Project Change (NPC) – An environmental document filed in accordance with the Massachusetts Environmental Policy Act, M.G.L. c. 30, sections 61 through 62H, inclusive, if there is any material change in a project prior to the taking of all Agency Actions for the project. The continuation of the project by a new proponent shall not by itself constitute a change in the Project, provided that the new proponent adopts all mitigation measures to which the previous Proponent committed. The NPC shall specify in detail any change in the information provided in any previous review document. In determining whether a change in a project or the lapse of time might significantly increase environmental consequences, the Secretary shall consider the following factors:

- a) Expansion of the Project: A change in a project is ordinarily insignificant if it results solely in an increase in square footage, linear footage, height, depth or other relevant measures of the physical dimensions of the project of less than ten percent over estimates previously reviewed, provided the increase does not meet or exceed any new thresholds.
- b) Generation of further impacts, including an increase in release or emission of pollutants or contaminants during or after completion of the project. A change in a project is ordinarily insignificant if it results solely in an increase in impacts of less than twenty-five percent of the level specified in any review threshold, provided that cumulative impacts of the project do not meet or exceed any review thresholds that were not previously met or exceeded.
- c) Change in expected date for commencement of the project, commencement of construction, completion date for the project, or schedule of work on the project.
- d) Change of the project site.
- e) New application for a permit or new request for financial assistance or a land transfer.
- f) For a project with net benefits to environmental quality and resources or public health, any change that prevents or materially delays realization of such benefits.
- g) For a project involving a lapse of time, changes in the ambient environment or

information concerning the ambient environment.

O

Object – Includes, but is not limited to, above ground structures, NAVAIDs, people, equipment vehicles, natural growth, terrain, and parked aircraft.

Object Free Area (OFA) – An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Obstacle – An existing object, object of natural growth, or terrain at a fixed geographical location or which may be expected at a fixed location within a prescribed area with reference to which vertical clearance is or must be provided during flight operations.

Obstacle Free Zone (OFZ) – The OFZ is the airspace below 150 feet (45 m) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches. The OFZ is subdivided as follows:

- **Runway OFZ** – The airspace above a surface centered on the runway centerline;
- **Precision Approach Category I (CAT I) Runway** – A runway with an instrument

approach procedure which provides for approaches to a decision height (DH) of not less than 200 feet (60m);

- **Runway Protection Zone (RPZ)** – An area off the runway end to enhance the protection of people and property on the ground;
- **Runway Safety Area (RSA)** – A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway;
- **Shoulder** – An area adjacent to the edge of paved runways, taxiways or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection;
- **Taxilane (TL)** – The portion of the aircraft parking area used for access between taxiways and aircraft parking positions;
- **Taxiway (TW)** – A defined path established for the taxiing of aircraft from one part of an airport to another;
- **Taxiway Safety Area (TSA)** – A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway;
- **Visual Runway** – A runway without an existing or planned straight-in instrument approach procedure.

The OFZ is a three dimensional volume of airspace which protects for the transition of aircraft to and from the runway. The OFZ

clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible NAVAID locations that are fixed by function. Additionally, vehicles, equipment, and personnel may be authorized by air traffic control to enter the area using the provisions of Order 7110.656, Air Traffic Control, paragraph 3-5. The runway OFZ and, when applicable, the inner-approach OFZ and the inner-transitional OFZ, comprise the OFZ.

Operable Unit (OU) – A discreet portion of a site that is investigated and cleaned up separately from other portions of the site. Dividing a site into two or more operable units allows separate investigations and cleanups to proceed at their own pace. Common examples are investigating soil and groundwater contamination separately, and cleaning up and redeveloping small portions of a larger site.

Outer Marker – A marker beacon at or near the glide slope intercept altitude of an ILS approach. It is keyed to transmit two dashes per second on a 400 Hz tone, which is received aurally and visually by compatible airborne equipment. The OM is normally located four to seven miles from the runway threshold on the extended centerline of the runway.

Outstanding Resource Water (ORW) – A water or a wetland bordering a water that has been designated by the Massachusetts Department of Environmental Protection as an Outstanding Resource Water (ORW). ORWs include public water supplies, certified vernal pools, and other waters that constitute an outstanding resource as determined by their outstanding socio-economic, recreational, ecological and/or aesthetic values.



Overhead Maneuver – A series of predetermined maneuvers prescribed for aircraft (often information) for entry into the VFR traffic pattern and to proceed to a landing. An overhead maneuver is not an IFR approach procedure. These aircraft shall be considered VFR and the IFR flight plan is canceled when the aircraft crosses the landing threshold on the initial approach portion of the maneuver.

Oxides of Nitrogen (NOX) – Regulated air pollutants representing different combinations of oxygen and nitrogen. The U. S. EPA has established regulations, including a NAAQS, for nitrogen dioxide (NO₂).

Ozone (O₃) – A regulated air pollutant formed from reactions between Volatile Organic Compounds (VOC) and oxides of nitrogen in the presence of sunlight, primarily during summer months. Also generally known as smog.

P-Q

Particulate Matter (PM_{2.5}) – Regulated fine particle matter in the air with a diameter of 2.5 micron or less. One micron is one-millionth of a meter.

Particulate Matter (PM₁₀) – Regulated coarse particle matter in the air with a diameter of 10 micron or less. One micron is one-millionth of a meter.

Polychlorinated biphenyl (PCB) – Mixtures of up to 209 individual synthetic chlorinated compounds. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the

U.S. in 1977 because of evidence that they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and hydraulic oils. There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow, and have no known smell or taste.

Precision Approach Path Indicators (PAPI)

– A visual aid consisting of a system of lights installed on the side of the runway that provide visual descent guidance information during approach to a runway to provide for the aircraft crossing the runway threshold at an appropriate height. A PAPI is intended primarily for use during VFR weather conditions.

Precision Approach Procedure – A standard instrument approach procedure in which an electronic glide slope/glide path is provided; e.g., ILS/MLS and Precision Approach Radar (PAR).

Precision Approach Radar (PAR) – Radar equipment in some Air Traffic Control facilities operated by the FAA and/or the military services at joint-use civil/military locations and separate military installations to detect and display azimuth, elevations, and range of aircraft on the final approach course to a runway. PAR provides both horizontal and vertical guidance to approaching pilots.

Propylene glycol – An organic compound that is used as ingredient in aircraft deicing solutions.

R

Reasonably Available Control Technology

– Requires the use of reasonably available control requirements to reduce or limit air emissions from sources in areas that do not meet national ambient air quality standards (i.e., non-attainment areas).

Response Action Outcome (RAO)

– A designation applied to a disposal site, as defined under the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000, at which there is No Significant Risk, also as defined by the MCP. The goal of assessment and mitigation activities under the MCP is to achieve conditions of No Significant Risk. Attainment of a Response Action Outcome (RAO) is considered a significant milestone in the progression through MCP activities, and in many (but not all) cases serves as an endpoint to those activities.

Record of Decision (ROD) – In the Commonwealth of Massachusetts, a document issued by the Secretary of Environmental Affairs on a project where a waiver of a MEPA threshold or other MEPA requirement has been requested. At the federal level, a decision on an EIS filing.

Runway – A defined rectangular area on land airport prepared for the landing and takeoff run of the aircraft along its length. Runways are normally numbered in relation to their magnetic direction rounded off to the nearest 10 degrees; e.g., Runway 01, Runway 25.

Runway Alignment Indicator Lights (RAIL)

– A visual lighting system that provides information on the approach end of the runway

Runway End Identifier Lights (REIL) – See Airport Lighting.

Runway Protection Zone (RPZ) – See Obstacle Free Zone.

Runway Safety Area (RSA) – See Obstacle Free Zone.

Runway Visual Range (RVR) – See Visibility.

S

Single Event Level (SEL) – The total noise dose, or exposure, resulting from a time-varying sound that is normalized to a one second duration so that exposures of different durations can be compared on an equal basis. Because aircraft noise events last longer than one second, the time-integrated SEL always has a value greater in magnitude than the maximum sound level of the event – usually about seven to ten dB higher for most airport environments.

Small Airplane – An airplane of 12,500 pounds (5,700 kg) or less maximum certificated takeoff weight.

Spill Prevention Control and Countermeasure Plan (SPCCP)

– The cornerstone of the EPA's strategy to prevent oil spills from reaching the nation's waters. Requirements for maintaining SPCC Plans are dependent on facility operations and on site storage practices, as regulated under 40 CFR 112. SPCC Plans have prescribed elements for management and inspection of facilities' storage and handling operations, and are designed to ensure that such facilities put into place containment and other countermeasures that would prevent oil spills from reaching navigable waters.

State Implementation Plan (SIP) – A detailed plan prepared by the states to show how they will comply and maintain



compliance with national air quality rules. States prepare SIPs and submit them to the U.S. EPA for approval to meet specific requirements of the Clean Air Act, including the requirement to attain and maintain the National Ambient Air Quality Standards (NAAQS).

Stormwater Pollution Prevention Plan (SWPPP) – A plan developed in accordance with the requirements of a General or Individual NPDES permit issued pursuant to the U.S. Clean Water Act. The SWPPP sets forth the activities to be initiated at a site to minimize or prevent pollution of waters of the U.S. A SWPPP may be necessary for existing industries or planned construction projects. The development of the SWPPP includes site characterization and the implementation of specific BMPs to address activities at the site. The U.S. EPA is the permitting authority in Massachusetts. The Massachusetts DEP has review and approval of the SWPPP if the site discharges to an ORW.

Sulfur dioxide (SO₂) – A regulated air pollutant created by the combustion of materials containing sulfur. The U. S. EPA has established regulations, including a NAAQS, for SO₂.

T

Taxi – The movement of an airplane under its own power on the surface of an airport (Part 135.100 – Note). Also, it describes the surface movement of helicopters equipped with wheels.

Taxilane (TL) – See Obstacle Free Zone.

Taxiway (TW) – See Obstacle Free Zone.

Taxiway Safety Area (TSA) – See Obstacle Free Zone.

Terminal Instrument Procedures – TERPS establishes criteria that are used to formulate and publish procedures for instrument approach and departure of aircraft to and from civil and military airports.

Terminal Radar Approach Control (TRACON) – Controls aircraft in the vicinity of a large airport, between the departure or arrival airport and the Air Route Traffic Control Center.

Terminal-Very High Frequency Omnidirectional Range Station – A very high frequency terminal omnidirectional range station located on or near an airport and used as an approach aid.

Threshold – The beginning of that portion of the runway usable for landing.

Time Above a decibel threshold (TA) – Because analyses of decibels are complex and often unfamiliar to the public, the FAA has developed a supplemental noise metric that is non-logarithmic: the amount of time (in minutes or seconds) that the noise source of interest exceeds a given A-weighted sound level threshold. Every time a noise event goes above a given threshold, the number of seconds is accumulated and added to any previous periods that the noise exceeded the threshold. These time-above-thresholds, or Time Above, are usually reported for a 24-hour period. Note that TA does not tell the loudness of the various noise events. Just as a single value of the A-weighted sound level ignores the dimension of time, so the TA ignores the dimension of loudness.

Time-In-Mode (TIM) – The time an aircraft spend in each mode of the LTO cycle.

Total Noise Exposure (EXP) – The EXP metric was developed in 1982 as a screening tool for Massport to assess changes in the fleet mix of aircraft operating at Hanscom Field overtime. EXP indicates changes in total noise exposure and expected resultant changes in DNL, without the need to prepare noise contours. The metric is calculated by logarithmically summing the representative SELs for each departure of an airplane assuming it flies over a single point on the ground. Similar aircraft types are grouped together in the calculations at creating a "partial EXP" for the group. Partial EXP values for each group are then summed to obtain a single number estimate of departure noise exposure at that reference location. Similar calculations are performed for arrival operations. Separate computations are performed for civil and military operations. Massport maintains a comprehensive database of operations conducted by aircraft heavier than single engine piston aircraft. EXP uses the same summation formula as DNL: logarithmic summation of all noise events over a 24-hour day, with a 10 dB penalty applied to events occurring between 10:00 p.m. and 7:00 a.m.

Total petroleum hydrocarbon (TPH) – A term used to describe a large family of several hundred chemical compounds that originally come from crude oil, which is refined to common petroleum products such as gasoline, motor oil, and jet fuel. Because there are so many different chemicals in petroleum products, it is not practical to measure each of them

individually, so TPH testing in the environment is often used as a measure of evidence of release of such products to soils, groundwater, or surface water.

Total suspended solids (TSS) – Solids in water that can be trapped by a filter (the combination of TSS and total dissolved solids together comprise Total Solids). TSS can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. High levels of TSS can pose risk to the aquatic life and natural stream processes.

Touch-And-Go – An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway.

Tower – A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity or an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the airport traffic area regardless of flight plan or weather conditions (IFR or VFR). A tower may also provide approach control services (radar or non-radar).

Traffic Pattern – The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg and final approach.

- **Upwind Leg** – A Flight path parallel to the landing runway in the direction of landing.
- **Crosswind Leg** – A flight path at right angles to the landing runway off its upwind end.



- **Downwind Leg** – A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg.
- **Base Leg** – A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline.
- **Final Approach** – A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. An aircraft making a straight-in approach VFR is also considered to be on final approach.

Transportation Demand Management (TDM) – Measures that make better use of existing transportation facilities by reducing the peak hour demand for automobile trips, as opposed to increasing roadway capacity. Examples of TDM measures include increased or expanded transit service, carpool/vanpool programs, employee rideshare programs, and staggered work hours.

Transportation Improvements Plan (TIP) – A five-year plan that programs federally fund roadway and transit projects. Metropolitan Planning Organization updates the TIP on an annual basis.

Transportation Management Association (TMA) – A structured organization typically comprised of employers interested in collectively improving transportation access to an area through the implementation of cost-sharing approaches such as Transportation

Demand Management (TDM) measures, public advocacy and marketing and information campaigns. The transportation access measures, as well as the dues and organizational structure, are tailored to the specific needs of the TMA membership.

Transportation Management Initiative (TMI) – A program that is administered by MassRIDES on behalf of the Executive Office of Transportation. The program funds a MassRIDES staff coordinator to plan and administer TDM actions with members. Membership in the program is free. Benefits are provided based on the level of participation in TDM, with employees of partner companies eligible to use MassRIDES's guaranteed ride home program.

Transportation Security Administration (TSA) – Federal agency created as part of the Aviation and Transportation Security Act passed by the U.S. Congress and signed into law on November 19, 2001 and in response to the September 11, 2001 attacks on the World Trade Center and The Pentagon. The agency is charged with developing policies to ensure the safety of U.S. air traffic and other forms of transportation.

Trip (vehicle) – A trip represents one vehicle entering or leaving a facility. A vehicle entering *and* leaving a facility represents two vehicular trips.

V

Vehicle Miles Traveled (VMT) – The product of the number of vehicles on a given roadway by the length of the roadway. The units are vehicle miles per year.

Vehicle Occupancy Rate (VOR) – Number of persons per vehicle.

Vegetation Management Plan (VMP) – A program of actions by Massport at Hanscom Field to comply with FAA regulations and Massachusetts General Laws regarding protected airspace. The VMP includes vegetation removal project addresses obstructions. Massport implemented the VMP in 2004. Since then, the VMP has moved into a maintenance phase.

Visibility – The ability, as determined by atmospheric conditions and expressed in units of distance, to see and identify prominent unlighted objects by day and prominent lighted objects by night. Visibility is reported as statute miles, hundreds of feet or meters.

- **Flight Visibility** - The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.
- **Ground Visibility** – Prevailing horizontal visibility near the earth's surface as reported by the United States National Weather Service or an accredited observer.
- **Runway Visual Range (RVR)** – An instrumentally derived value, based on standard calibrations, that represents the horizontal distance a pilot will see down the runway from the approach end. It is based on the sighting of either high intensity runway lights or on the visual contrast of other targets, whichever yields the greater visual

range. RVR, in contrast to prevailing or runway visibility, is based on what a pilot in a moving aircraft should see looking down the runway. RVR is horizontal visual range, not slant visual range. It is based on the measurement of a transmissometer made near the touchdown point of the instrument runway and is reported in hundreds of feet. RVR is used in lieu of RVV and/or prevailing visibility in determining minimums for a particular runway.

- **Touchdown RVR** – The RVR visibility readout values obtained from RVR equipment serving the runway touchdown zone.
- **Mid-RVR** – The RVR readout values obtained from RVR equipment located midfield of the runway.
- **Rollout RVR** – The RVR readout values obtained from RVR equipment located nearest the rollout end of the runway.

Visual Approach - An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic facility and having an air traffic control authorization, may proceed to the airport destination in VFR conditions.

Visual Approach Slope Indicators (VASI) – See Airport Lighting

Visual Flight Rules (VFR) – Rules that govern the procedures for conducting flight under visual conditions. The “VFR” is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.



Visual Flight Rules (VFR) Conditions – Weather conditions equal to or better than the minimum for flight under visual flight rules.

Visual Meteorological Conditions – Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specified minima.

Volatile Organic Compounds (VOC) – Hydrocarbons associated with motor fuels that are highly reactive and may help form ozone.

VORTAC - A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site.

W-Y

Wetlands Protection Act (WPA) – An Act (MGL Chapter 131 Section 40) that protects Massachusetts wetlands resources and ensures that the beneficial functions of these resources are maintained. Projects that affect wetlands are required to avoid impacts where possible, minimize unavoidable impacts, and mitigate for unavoidable impacts. Proponents of projects in wetlands or in the buffer zone around them must apply for an Order of Conditions from the municipal Conservation Commission.

Z

Zero Emissions Vehicle (ZEV) – A vehicle that has no air pollution emissions directly associated with it (e.g. vehicles powered with electricity or hydrogen fuel cells).

Distribution List

Those entities and individuals indicated with an * received a printed copy of the 2017 L.G. Hanscom Field Environmental Status and Planning Report. The 2017 L.G. Hanscom Field Environmental Status and Planning Report is also available on the Massport website.¹

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¹ <http://www.massport.com/massport/about-massport/project-environmental-filings/hanscom-field/>



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All individuals who submitted comments
on the *2012 ESR* or the *2017 ESR*
Proposed Scope received printed copies of
the *2017 L.G. Hanscom Field Environmental
Status and Planning Report*.



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Appendix A — Draft Scope, MEPA Certificate, and Responses to Comments



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October 2, 2017

Secretary Matthew A. Beaton
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Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
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Boston MA 02114A

Re: **Proposed Scope 2017 L. G. Hanscom Field Environmental Status & Planning Report**
Bedford, MA, EEA Number: 5484/8696

Dear Secretary Beaton and Director Buckley:

The Massachusetts Port Authority (Massport) is pleased to submit for your review this Proposed Scope for the 2017 L. G. Hanscom Field Environmental Status & Planning Report (ESPR), the next filing in an ongoing review and evaluation of current and potential future operating and environmental conditions at Hanscom Field. The Proposed Scope is being submitted in accordance with the provisions of the Massachusetts Environmental Policy Act (MEPA), G.L. Chapter 30, Sections 62-62H and its regulations, 301 Code of Massachusetts Regulations (CMR) 11.00. The Proposed Scope responds to the Secretary's March 21, 2014 Certificate on the 2012 ESPR. A copy of the reviewers list is also attached.

Massport is requesting a 30-day comment period to accommodate community review with the close of comments on November 9, 2017. The public MEPA Scoping Session, is scheduled for 6:30 PM on Tuesday October 24, 2017 at the Hanscom Field Civil Air Terminal. Massport will also be available to participate in additional community meetings within the public comment period to discuss the scope, as needed.

Michael Gove will serve as the ESPR Project Manager. Michael, I and members of Massport's staff are available to discuss the ESPR and attached proposed scope with you or your staff if needed. Please contact Michael at 617-568-3546 or me at 617-568-3524 with any questions or comments.

Sincerely,

Massachusetts Port Authority

Stewart Dalzell, Deputy Director
Environmental Planning and Permitting
Massachusetts Port Authority

Attachments

Cc: S. Williams, A. Goodspeed, G. Carr, M. Gove, L. Becker, A. Gallagher/Massport

Proposed Scope
2017 L. G. Hanscom Field
Environmental Status & Planning Report
October 2, 2017

PROJECT NAME: 2017 Hanscom Field Environmental Status & Planning Report
PROJECT LOCATION: Bedford, Massachusetts
EEA NUMBER: 5484/8696
PROJECT PROPONENT: Massachusetts Port Authority

The Massachusetts Port Authority (Massport or Authority) is committed to a multi-modal, multi-airport, multi-state regional transportation program that will satisfy future regional aviation demand. A key component of that transportation program is the use of regional airports to complement Boston-Logan International Airport (Logan). L.G. Hanscom Field, which is located in the four towns of Bedford, Concord, Lincoln, and Lexington, is New England's premier general aviation (GA) airport. Minute Man National Historical Park is located just south and west of the airport in Lincoln and Concord. As a reliever to Logan, Hanscom Field provides airside relief by annually serving approximately 122,000 GA operations. Hanscom Field handles over six times more GA operations than occur at Logan and has supported niche commercial service. This role for Hanscom Field was first established in the Master Plan for the airport in 1978, clarified in the 1980 Noise Rules, restated in the 1995 Generic Environmental Impact Report (GEIR), the 2000 L. G. Hanscom Field Environmental Status & Planning Report (ESPR), the 2005 ESPR, and the 2012 ESPR and continues to serve as a guide.

Hanscom Field's Master Plan and Noise Rules

Massport has owned Hanscom Field since 1974. The airport is located approximately 20 miles northwest of Boston just outside Route 128/I-95 and is convenient to most of metropolitan Boston. The Federal Aviation Administration (FAA) identifies Hanscom Field as a reliever airport. As such, its primary role in the regional aviation system is to accommodate regional GA needs, which has included some commercial and cargo service. This allows larger nearby airports to concentrate on large-scale commercial and cargo activity.

In 1978, Massport prepared a Master Plan for the airport. The preparation of the Master Plan included a lengthy and comprehensive public process. In 1980, after additional public process, the Authority adopted the Hanscom Field Noise Rules, which were an outgrowth of the Master Plan. The Master Plan and the 1980 Noise Rules remain the framework for airport planning and operations today.

The variety of aviation activities at Hanscom Field include private corporate aviation, recreational flying, pilot training, air charter, cargo, commuter service and limited military flights. The Master Plan and the 1980 Noise Rules contemplate and provide for commercial airline service. In fact, the 1980 Noise Rules specifically allow for passenger aircraft with up to 60 seats. Commercial airlines have operated periodically at Hanscom Field since the mid-1970s. Streamline was the most recent airline to provide scheduled passenger services. Currently, there is no scheduled passenger service at Hanscom.

History and Purpose of Environmental Status and Planning Report

The Massachusetts Secretary of the Executive Office of Energy & Environmental Affairs (Secretary) has, since 1985, required that the Authority prepare an *Environmental Status and Planning Report* (ESPR) every five years to evaluate the cumulative effect of growth and change at Hanscom Field and provide data and analyses on noise, ground transportation, air quality, and water quality. The original GEIR, the 1995 GEIR Update, the 2000 ESPR, the 2005 ESPR, the 2012 ESPR, as well as the forthcoming 2017 ESPR, were designed to provide a retrospective analysis of the environmental effects of Hanscom Field while including analyses for future conditions.

As a result, the ESPR is an effective planning tool from which the Authority's policy and program developments are derived. The 2017 ESPR will present an overview of the operational environment and planning status of Hanscom Field and will provide long-range projections of environmental conditions against which the effects of future individual projects can be compared. The ESPR will provide historical environmental information, current information, and a forecast of future environmental effects at Hanscom Field. The ESPR does not replace the requirement for filing an Environmental Notification Form (ENF) or other state and federal permit application for a specific project if that project meets or exceeds a MEPA or other environmental regulatory threshold.

Massport filed its 2012 ESPR with the Executive Office of Energy and Environmental Affairs (EEA) in December 2013. The 2012 ESPR contains an extensive discussion on air and ground transportation, cultural and historical resources, and detailed information on such technical issues as noise abatement, air quality, ground access, and water quality management. The MEPA Certificate issued by the Secretary on March 21, 2014 determined that the 2012 ESPR "adequately and properly complies with the Massachusetts Environmental Policy Act." The Secretary's Certificate requires that the major areas of analyses for the next ESPR include, but are not limited to, aviation planning, landside planning, ground access, noise, air quality, water quality, cultural and historical resources, sustainability and airport mitigation.

Public Review and Participation

In developing this proposed Scope, the Authority reviewed the MEPA Certificate for the 2012 ESPR. Per the proposed schedule, the Authority will convene the following:

- MEPA scoping session (October 24, 2017)
- Convene up to four technical workshops during the public review process for the ESPR which will be in addition to the MEPA meeting for the ESPR.

Format of the 2017 ESPR

The 2017 ESPR will be a single document that follows the general format of the 2012 ESPR. In addition, Massport provides the Yearly Noise Report and the State of Hanscom every year to the public. Detailed ESPR technical studies will be summarized in a readable format to illustrate clearly the implications of recent trends, existing conditions and potential future scenarios. The ESPR will build on the base information developed for the 2012 ESPR, presenting policy considerations and an overview of the airport's current and potential future role within the regional planning context, including a status report on the Authority's proposed planning initiatives and projects. The 2017 ESPR technical studies will include analysis of airport activity levels, noise, ground access, air quality, water quality, natural resources, cultural and historical resources, and sustainability. The chapters on ground transportation management, noise, air quality, and water quality will include the following sections:

- Discussion of analysis methodologies and assumptions
- Report of 2017 conditions in comparison to previous years
- Prediction of 2025 and 2035 conditions

Forecasted activity levels for the future years may occur earlier or later than the forecast, but the analysis years of 2025 and 2035 will provide useful parameters for the analytical framework.

CD-ROM (or other electronic format) versions and limited printed copies of the ESPR will be available for public review. The ESPR will be posted on the Authority's web page. Supporting technical appendices will be provided as necessary. The following describes the proposed ESPR sections.

I. Introduction

This section will generally introduce the ESPR and place it in its environmental and regulatory context. This section will:

- Summarize the evolution of the Hanscom Field environmental review process.
- Describe the analysis framework for the environmental reporting and technical studies to be conducted.
- Describe the organization of the 2017 Hanscom Field ESPR.
- Summarize the major sections of the ESPR, with supporting graphics and data tables.

II. Facilities and Infrastructure

This section will update information presented in the 2012 ESPR regarding the airfield and its supporting infrastructure and utility system, including:

- The use and storage of hazardous materials at Hanscom Field, including jet fuel use and spill prevention efforts
- The status of the Authority's tenant audit program
- The current status of the 21E sites at Hanscom Field

III. Airport Activity Levels

This chapter will report on airport activity levels for 2012 to 2017 and describe the new forecasts of aviation activity for 2025 and 2035. This is based on aviation forecasts done for all three Massport airports; Logan, Hanscom, and Worcester. The ESPR will use forecasts to assist in developing fleet projections for each future analysis year.

The 2017 ESPR will describe historic airport activity levels. The ESPR uses specific analysis years to integrate airport activity levels with other areas of analysis, such as traffic projections. The ESPR will provide an update of activity levels at Hanscom Field according to the following:

- Report on aircraft fleet mix and on activity levels of GA, commuter and military operations from 2012 to 2017.
- Compare 2012-2017 activity levels to historic trends.
- Compare actual 2017 activity levels to forecasted 2010 activity levels from the 2012 ESPR.
- Report on current and future trends within the aviation industry.

The ESPR will utilize forecasts developed for aviation activity for 2020 and 2030 based on recent trends at Hanscom Field and with consideration of the role that the airport plays in the regional airport system. The ESPR will report actual changes in fleet mix and aircraft operations at Hanscom Field – both increases and decreases – and compare these data to the range of future activity levels and fleet mix defined by the moderate growth scenarios of the 2017 ESPR. Differences between actual and previously forecast activity levels will be explained and will be reflected in the underlying assumptions for the 2025 and 2035 forecasts. The forecasts will also include coordination with forecasting for the Logan ESPR.

- Prepare a 2025 growth scenario for activity levels and passenger forecasts.
- Prepare growth scenario for activity levels that will vary the fleet mix and passenger forecasts for the year 2035, which is consistent with the Logan ESPR and other regional planning efforts.

The fleet mix of the growth scenarios will include GA, military, commuter service and some cargo activity consistent with the 1978 Master Plan and 1980 Noise Rules. The scenarios will be based on recent trends at the airport as well as regional and national aviation trends.

IV. Airport Planning

The Authority continues to assess planning strategies for operating an efficient airport in an environmentally sensitive manner. As owner and operator of Hanscom Field, the Authority also must accommodate and guide airport tenant development. This section will describe the status of planning initiatives and projects for the Terminal, airside and landside areas.

This chapter will also report planning and development initiatives by the Minute Man National Historical Park, the Hanscom Air Force Base and the four contiguous towns that affect Hanscom Field and are affected by Hanscom Field.

V. Regional Transportation Context

Hanscom Field is the premier GA facility serving Massachusetts and the New England region. The ESPR will describe the role of Hanscom Field in the region's transportation system, and will report on the Authority's efforts to strengthen the regional transportation system and on its cooperative efforts with other transportation agencies to promote an efficient regional aviation system with improved public/private transportation access. The ESPR will also describe Massport's system of three airports and efforts to better utilize these facilities. This chapter will update the information provided in the 2012 ESPR with the most current information provided in the Logan EDRs and ESPR in relation to Hanscom Field and will include the following:

- For 2017, a report on regional airport operations, passenger activity levels, and the status of plans and new improvements as provided by regional airport authorities and a report on recent rail service initiatives by others that could affect air passenger travel including the North-South Station Rail Link, Acela Service, and bus service.
- A discussion of the role that Logan International Airport plays in intercity travel choices.
- Diversion opportunities to alternative modes and to New England airports.
- A report on the integration of New England regional airport facilities as a regional system
- A report on Hanscom Field's role in the GA airport network.
- A report on the current status of the ground access improvements at the four New England regional airports (Logan International Airport, T. F. Green Airport, Manchester Airport and Worcester Regional Airport) by state transportation agencies, including projected dates for completion of studies and/or construction and an analysis to quantify the effects of these measures upon projected passenger levels at each of the airports.

In addition, the ESPR will report on the Authority's efforts to promote service at Worcester and other airports, as well as other Authority involvement to promote the regional transportation system.

A summary of relevant regional and local highway studies and transit projects will be included.

VI. Ground Transportation

The 2017 ESPR will report on Ground Transportation conditions using the following indicators:

- Traffic, roadway and access analysis results
- Mode share data
- Alternative transportation modes; availability and use.
- Parking demand and management information

Background growth in traffic within the Study Area attributed to Hanscom Field as compared to other area sources will be evaluated. The Study Area for the traffic analysis in the 2012 ESPR was bounded by Route 2A, Old Bedford Road, Route 62, Routes 4/225 and Route 128/I-95. The 2017 ESPR will include up to 10 intersections including those described in the 2012 ESPR where Hanscom

Field traffic was found to contribute 10-percent or more to the existing traffic volumes on each intersection approach. The 2017 ESPR will also use this approach to evaluate the Study Area intersections for the forecast activity levels and years.

Analyses conducted in support of the 2017 ESPR and other available information indicate that Hanscom Field currently does not have a sufficient commuting population to support a Transportation Management Association (TMA). The potential for developing partnerships with abutters and area businesses to facilitate a regional Transportation Demand Management (TDM) approach will be discussed in the ESPR. Other special topics will address recent studies, and issues raised in previous ESPR Certificates, reviewers' comments, and will:

- Report available information from the Authority's survey of Hanscom Field employees.
- Describe TDM strategies including potential for participation in a TMA.
- Review, summarize and analyze, as necessary, existing metropolitan transportation documents and report as to how they relate to Hanscom Field access.

VII. Noise

The Noise chapter of the ESPR will report current conditions for the year 2017 and projections for the forecast activity levels and years using the following indicators:

- Update EXP reference levels as needed
- Day-Night Average Sound Level (DNL) contours
- Time-Above (TA) contours for a Given Threshold

All noise contour levels will be computed using the AEDT. The DNL levels depicted will be based on accepted EPA and FAA guidelines. Impacts assessment for both DNL and TA will be based on data from the 2010 U.S. Census. The ESPR will present the noise data from the six permanent monitoring stations at Hanscom Field including minimum, maximum and average daily DNL values. Special topics will address recent studies, and issues raised in previous ESPR Certificates, reviewers' comments, and will include, in consultation with the Authority:

- A report on the Fly Friendly program at Hanscom Field and recommended touch and go procedures over the MMNHP.
- An analysis and review for areas that are affected by noise from aircraft upon start-up and take-off roll.
- Update on the incorporated recommendations from the 1999 Report of the Hanscom Field Noise Workgroup.
- Update on new noise monitoring system.

VIII. Air Quality

The Air Quality chapter of the 2017 ESPR will report current conditions for the year 2017, industry update on airport-related greenhouse gasses (GHG's), and projections for the forecast activity levels and years using the following indicators:

- Emissions Inventory for:
 - Carbon Monoxide (CO)
 - Oxides of Nitrogen (NOx)
 - Volatile Organic Compounds (VOCs)
 - Particulate matter (PM10) and (PM2.5)
 - Green House Gases (GHG)

-
- Available monitoring results for:
 - Ozone Precursors
 - Nitrogen Dioxide (NO₂)

IX. Wetlands/Wildlife/Water Resources

The ESPR will include the most recent, wetlands delineation, and the identified vernal pools. The ESPR will report wildlife habitat mapping using available information from Massachusetts Natural Heritage and Endangered Species Program (NHESP). The ESPR will provide an update of the Authority's vegetation management program at Hanscom Field.

The ESPR will report on any incremental changes to the Hanscom Field storm water management system and to the Storm Water Pollution Prevention Plan (SWPPP). The ESPR will report on the water quality monitoring program at the Shawsheen River. The ESPR will provide any available public information on the National Pollutant Discharge Elimination System (NPDES) permit, and the SWPPP. Reporting indicators for water quality improvement will include NPDES Permit monitoring results. The ESPR will also report on the deicing monitoring program. The 2017 ESPR will also report on the Vegetation Management Plan, the Hanscom Field Grassland Management Program and all associated monitoring and maintenance.

X. Cultural and Historical Resources

The 2017 ESPR will review and update the extensive data on historic and archeological resources completed as part of the 2012 Hanscom Field ESPR. The most current version of the State Register of Historic Places and the files of the Massachusetts Historical Commission will be reviewed, as will previous available planning studies conducted within or adjacent to Hanscom Field. This information will be compared to the 2012 ESPR and updated where appropriate in the 2017 ESPR.

XI. Sustainable Development and Environmental Management System

The Sustainable Development and Environmental Management System (EMS) chapter of the ESPR will report on the development of the Authority's Sustainable Development Program and the EMS Program at Hanscom. The Authority received an ISO 14001 Certification for Hanscom Field in 2001, making it the first airport in the nation to qualify. The Certification establishes objectives and targets, monitoring procedures and roles and responsibilities to track and manage the environmental performance of Hanscom Field. This chapter will include a discussion of the following:

- Summary of existing sustainable practices currently being undertaken by the Authority at Hanscom Field
- Report on recycling policy and efforts
- Report on toxic reduction at the airport
- Report on the EMS Program at Hanscom Field, including the ISO 14001 Certification
- Opportunities for sustainable development practices

XII. MEPA Documentation

This section will include a copy of the Secretary's 2014 Certificate on the 2012 Hanscom Field ESPR, a copy of the Secretary's Certificate on the scope for the 2017 ESPR, a reviewers list and a glossary of terms. Supporting Technical appendices will be included in the report as necessary. The ESPR will respond to comments on the Proposed Scope in a topical format.

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Bedford

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Concord

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A.1 Commenters on Scope

The following is a list of commenters whom submitted comments to the Secretary of Energy and Environmental Affairs (EEA) during the MEPA public comment period when MEPA issued a draft scope for the 2017 *ESPR*.

Table A-1 Comments with Response Identifiers

Commenter	Date of Comment	Form of Comment (Letter/Email/etc.)	Contact Information	Massport Comment Response Identifiers
Matthew A. Beaton Secretary of Energy and Environmental Affairs, Commonwealth of Massachusetts	11/16/2017	Scope Certificate	Matthew A. Beaton Office of Energy and Environmental Affairs 100 Cambridge St, Suite 900 Boston, MA 02114	EEA-1 – EEA-57
Chris Boles Bedford Resident	11/5/2017	Email	Chris Boles 243 Bedford Road Bedford, MA 01730	CBO-1 – CBO-8
Town of Lexington Board of Selectmen, Suzanne E. Barry, Chairman	11/6/2017	Letter	Suzanne E. Barry, Chairman Lexington Board of Selectmen 1625 Massachusetts Avenue Lexington, MA 02420	LEX-1 – LEX-11
Natural Heritage & Endangered Species Program (NHESP), Massachusetts Division of Fisheries & Wildlife, Everose Schluter, Chief of Regulatory Review	11/7/2017	Email	Everose Schluter Chief of Regulatory Review Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife 1 Rabbit Hill Road Westborough, MA 01581	ESP-1
Jennifer Boles Bedford Resident	11/8/2017	Email	Jennifer Boles 243 Bedford Road Bedford, MA 01730	JBO-1 – JBO-5
Ann Seamans Bedford Resident	11/8/2017	Email	Ann Seamans Concord Road Bedford, MA	SEA-1 – SEA-2

Town of Bedford Board of Selectmen, Hanscom Field Advisory Commission, Mike Rosenberg, Chair	11/9/2017	Letter	Mike Rosenberg Chair, Hanscom Field Advisory Commission, Bedford Board of Selectmen 387 Concord Road Bedford, MA 01730	BED-1 – BED-2
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A.2 Massport Response to Comments on Scope

The following is a list of summarized comments submitted to the Secretary of Energy and Environmental Affairs (EEA) during the MEPA public comment period when MEPA issued a draft scope for the 2017 *ESPR*. For each comment, a formal response from Massport is provided. The reader may also be referred to a specific section of the 2017 *ESPR* where a more detailed answer to the comment can be found.

Table A-2 Response to Comments

Comment Number	Comment	Response
EEA Secretary's Certificate, November 16, 2017		
Airport Facilities and Infrastructure		
EEA-1	Describe facilities and infrastructure at Hanscom, including use, ownership, condition and maintenance practices and responsibilities	A current inventory of facilities and infrastructure at Hanscom was conducted as part of the 2017 <i>ESPR</i> . See Sections 2.2 and 2.3, Tables 2-1 and 2-2, and Figure 2-1.
EEA-2	Report on the use and storage of hazardous materials such as jet fuel, and identify measures to minimize and mitigate release of these materials	Massport has developed a Spill Prevention Control and Counter measures (SPCC) Plan that covers general Massport operations. Tenants that store a total of more than 42,000 gallons of oil in underground storage tanks (USTs) and/or more than 1,320 gallons of oil in ASTs or containers are required to have a SPCC Plan as required under 40 CFR 112 (Oil Pollution Prevention). For more information, see Section 2.4.6 and Table 2-6.
EEA-3	Identify areas regulated under M.G.L 21E, the Massachusetts Contingency Plan (MCP), and provide status reports	Hazardous materials and disposal site remediation, see Section 2.4.6 and Table 2-8.

Comment Number	Comment	Response
EEA-4	Report on the past, current and projected water use and wastewater generation	A history of water usage from 1993 to 2017 is presented in Figure 2-3. Daily average wastewater flows from 1995 through 2017 are included in Figure 2-5. Water use has stayed below earlier ESPR projections. Based on existing water use, available system flow capacity, and the projected development scenarios, the existing water systems are sized to supply potable water flows required for each of the future growth scenarios. See Section 4.3.1. Wastewater generation has also remained below levels analyzed in the 2005 and 2012 ESPRs, and the existing on-site wastewater system is expected to have the capacity to accommodate growth scenarios included in the 2017 ESPR, as described in Section 4.3.2.
EEA-5	Describe water and sewer infrastructure	The sanitary sewer system is described in Section 2.4.4 and Figure 2-6. The stormwater management and drainage system is described in Section 2.4.5. Existing Hanscom Field water system is shown in Figure 2-4.
Airport Activity Levels		
EEA-6	Report on activity levels for 2012 to 2017	Hanscom's total aircraft operations have decreased by 5 percent annually from approximately 166,000 operations in 2012 to 129,000 operations in 2017. See Section 3.3.
EEA-7	Growth forecasts of aviation activity for 2030 and 2035	Aviation activity is forecast to increase from approximately 129,000 operations in 2017 to 132,000 operations in 2025 and 139,000 operations in 2035. These projects are below both historic peaks and 2012 forecasted levels. See Section 3.4.
EEA-8	Fleet projections for each analysis year	Fleet projections are included in Section 3.4.5 and Table 3-10.
Airport Planning		
EEA-9	Status of planning initiatives for the terminal, airside area and landside area	Planning initiatives are described in Chapter 4 and listed in Table 4-8.
EEA-10	Identify projects that may be subject to MEPA review	Projects subject to MEPA review are covered in Section 4.2.5.

Comment Number	Comment	Response
EEA-11	Planning and development initiatives by the MMNHP, the Hanscom Air Force Base, and the four contiguous towns that affect Hanscom Field and are affected by Hanscom Field	Planning initiatives of Hanscom stakeholders including MMNHP and Hanscom AFB are described in Section 4.1.8. Local municipality planning initiatives, including those of Bedford, Concord, Lexington, and Lincoln are described in Section 4.1.7.
Regional Transportation		
EEA-12	Hanscom's role in regional transportation and efforts by Massport to coordinate the use of its three airports	Hanscom's role in the regional transportation system and specifics concerning the role of each Massport owned airport are described in Section 5.2.
EEA-13	Status report on regional airport operations, passenger activity levels, and any improvements or planned changes to the regional airport network	Regional general aviation (GA) activity trends, including airport operations and high level changes to regional (GA) airport network are covered in Section 5.3 Regional commercial service trends including passenger activity and high level trends are included in Section 5.4.
EEA-14	Review of rail service initiatives by others that could affect air passenger travel	Section 5.7.1 reports on recent developments and current long-distance rail service originating in Boston, the status of air-rail linkages in the Northeast Corridor, and the Pilgrim Partnership, which provides commuter rail between Massachusetts and Rhode Island.
EEA-15	Role of Logan	The role of Logan is described in Section 5.2.2.
EEA-16	Diversion opportunities to other airports and alternative modes	Massport's efforts to support regional airport network are described in Section 5.2.4. Alternative modes of transportation are discussed in 5.7.
EEA-17	Report on integration of New England regional airport facilities as a regional system	Integration of the New England regional airport facilities is described among the various long range planning efforts in Section 5.6.
EEA-18	Status of ground access improvement at New England regional airports	The status of ground access improvements in Boston and the airports in the New England region is described in Section 5.7.
EEA-19	Update on Massport's efforts to promote service at Worcester and other airports	Efforts to promote service at Worcester and other airports are covered in Section 5.2.4.
EEA-20	Report on relevant regional and local highway and transit projects	Regional and local highway and transit projects are described in Section 6.2.

Comment Number	Comment	Response
Ground Transportation		
EEA-21	Report on traffic generated by activities at Hanscom and any impacts on the local roadway network	Hanscom peak traffic does not coincide with general morning and afternoon peak traffic in the surrounding area. Hanscom-related traffic along Route 2A, east of Hanscom Drive, contributed only two percent of peak hour traffic volumes. See Section 6.1.
EEA-22	Report on Transportation Demand Management (TDM) measures implemented at Hanscom to reduce single-occupancy vehicle (SOV) trips to and from the site, identify any additional TDM measures under consideration, and describe how the success of each measure will be evaluated	TDM measures to reduce SOV trips are described in Section 6.4.2.
EEA-23	Describe opportunity for formation of a Transportation Management Association (TMA) and its effect on SOV trip reduction	Due to multiple tenants with staggered working hours that reflect 24/7 airport operations and associated logistical challenges, a concentration of employees to warrant a formal TMA does not currently exist. Massport will continue to coordinate with Hanscom AFB regarding opportunities to extend one of the existing shuttles to serve Hanscom Field. Existing, local TMA efforts are described in Section 6.2.3.
Noise		
EEA-24	Report on current noise levels	Overall, there has been a decrease in operations at Hanscom Field over the last several years, and operations remain well below historical peaks. Noise also remains well below historical peaks. However, there have been some increases in jet operations and nighttime flights. Current and forecasted noise levels are discussed in Chapter 7 and Appendix D in detail.

Comment Number	Comment	Response
EEA-25	Compare current conditions to 2012 levels and projected future levels	Comparison of year 2017 noise contours with 2012 noise contours, including the major contributing factors, is covered in Section 7.4.1. Analysis concerning forecast scenarios for planning years 2025 and 2035, including figures of various forecast noise contours, are found in Section 7.6. Noise levels in 2017 were not typical due to Runway 11-29 closure for repaving that occurred in August of that year. Forecasts for future years 2025 and 2035 took this into account.
EEA-26	Describe any resulting changes to the analysis or interpretation of noise levels based on the use of AEDT	A high-level description of the use of AEDT is included in Section 7.1. Further description of the changes in noise analysis methodology from the 2012 analysis, including the use of AEDT is described in Section 7.3.3.
EEA-27	Provide updated Noise Exposure (EXP) reference levels, Day-Night Average Sound Level (DNL) contours, and Time-Above (TA) contours	Refer to Section 7.5.3 for updated Total Noise Exposure (EXP) reference levels. Figure 7-16 and Figure 7-17 depict the 55, 60, 65, and 70 dB DNL contours for the two future scenarios (2025 and 2035). In each figure, the 2012 and 2017 contours are also shown for comparison. Refer to Section 7.6.1. Updated Time Above contours are included in Section 7.5.2.
EEA-28	Calculate number of residents within each noise level scenario	A summary of U.S. Census Population Counts within DNL Contours is shown in Table 7-1.
EEA-29	Analyze noise levels in areas affected by noise from aircraft upon start-up and take-off roll	Massport has a well-defined aircraft engine maintenance run-up procedure for Hanscom Field. Aircraft are directed to the "run-up pad" located due south of Runway 11-29, west of the intersection with Runway 05-23. At the run-up pad, aircraft are directed to maintain a west heading when conducting run-ups; there is a short "blast fence" on the east side of the pad, which deflects jet exhaust, prop wash, and debris. Furthermore, Massport discourages operators from conducting nighttime run-ups but if extenuating circumstances require such activities they will be directed to the East Ramp at night. Refer to Section 7.9.3.

Comment Number	Comment	Response
EEA-30	Describe all noise mitigation measures, including Fly Friendly program and "touch and go" procedures over the MMNHP	Section 7.9 describes all noise mitigation measures, including the Fly Friendly Program in Section 7.9.7. Section 7.9.8 describes Massport's 2009 adjustments to the recommended touch-and-go flight tracks, which reduced the amount of direct flights over the more noise sensitive areas of MMNHP and nearby residences.
EEA-31	Describe MMNHP soundscape plan and effect of aircraft operations	According to the National Park Service (NPS), a final draft of the Acoustic Management Environmental Assessment report was completed in 2014, and development of the soundscape preservation and noise management plan for MMNHP is ongoing. Related information is included in Section 7.8.
Air Quality		
EEA-32	Report on 2017 air quality conditions and projected future emissions	Section 8.4.1 provides an analysis of 2017 air quality conditions. Combined pollutant emissions from both aircraft operations and groundside motor vehicle travel at Hanscom Field are shown in Table 8-9 for each of the six criteria pollutants in 2000, 2005, 2012, 2017, 2025 and 2035. Analysis of future emissions scenarios are presented in Section 8.4.2. The maximum air quality concentrations for all future planning scenarios are forecasted to comply with the National Ambient Air Quality Standards.
EEA-33	Description of mitigation measures implemented to minimize emissions	Beneficial measures implemented to minimize air pollutant emissions are described in Section 8.6.
EEA-34	Update summary of state of leaded fuel in aviation and latest leaded fuel fleet information	A summary of the state of leaded fuel in aviation is included in Chapter 8, Section 8.6 and expanded on in Appendix E, Section E.2.1, "Status of Lead Free Avgas in the United States."
EEA-35	Update on studies pertaining to ultrafine particulate matter (UFP) issues	The status of ongoing research on Airport-related UFP, including studies conducted at some European airports regarding the dispersion characteristics of UFPs is covered in Appendix E, Section E.2.2. Specific studies to assess health impacts of UFPs from airport sources have yet to be conducted. FAA conducts research on UFPs through the Center for Excellence for Alternative Jet Fuels and Environment (ASCENT) Program.

Comment Number	Comment	Response
EEA-36	Establish base level GHG emissions from which emissions reductions will be measured. Update on Massport's efforts to minimize GHG emissions, including FBOs.	Development and methodology of the first airport-wide GHG emissions inventory for Hanscom Field, to be used as a baseline to measure and compare against future GHG emissions is described in Section 8.5. Massport, along with FBOs, continue implementing beneficial measures to reduce on-site emissions where practicable. Measures related to fuel handling, ground service equipment, building heating/cooling, aviation support, airside operations, and the clean fuel vehicle program are discussed in Section 8.6.
Wetlands/Wildlife/Water Resources		
EEA-37	Status of the most recent delineation of wetlands and vernal pools, including latest maps	Conditions for existing wetland resource areas are described in Section 9.2.2, including detailed description of wetland resources as provided in Table 9-1. Delineations undertaken since the 2012 ESPR were project-specific and included small elements of larger systems previously delineated in 2012. These boundaries were incorporated into the wetland systems depicted shown in Figure 9-1 (map). Vernal pools are described in Section 9.2.3 and also shown in Figure 9-1.
EEA-38	Include maps of NHESP identified rare species	Portions of Hanscom Field are situated within an area identified by the NHESP as a Priority Habitat of Rare Species. The NHESP revised their statewide mapping in 2017, including several areas at Hanscom Field. The latest mapping is shown in Figure 9-2, Section 9.2.5.
EEA-39	Show Great Meadow National Wildlife Refuge (GMNWR) and other significant nearby areas of wetland and wildlife habitat on all maps of natural resource areas to provide context	GMNWR is shown and labeled on relevant figures.
EEA-40	Update Vegetation Management Plan and Grassland Management Plan	Both updates are provided in Section 9.2.5.
EEA-41	Update on stormwater management system and the SWPPP	Section 9.2.8 describes the stormwater management program for Hanscom Field, including stormwater modeling, stormwater-related permitting and monitoring programs undertaken by Massport, including the SWPPP.

Comment Number	Comment	Response
EEA-42	Report on changes in impervious area from 2012 to 2017 and for future projections	Chapter 2 presents information about impervious surfaces at Hanscom Field. Potential changes in impervious surface (acres) under 2025 and 2035 scenarios are shown in Table 9-10, Section 9.3.4.
Cultural and Historical Resources		
EEA-43	Review existing data on historic and archeological resources	Chapter 10 provides an update to the comprehensive reconnaissance survey originally completed for the 2005 <i>ESPR</i> , and updated in 2012, and provides updated information on historic properties in the <i>ESPR</i> General Study Area within and around Hanscom Field (see 10.6). A summary is in Section 10.1.1., including an archaeological resources overview. Refer to Chapter 10 for complete details.
EEA-44	Report on any changes to the MMNHP soundscape plan and goals and review coordination efforts between Massport and NPS	This information is included in Section 10.10.1 and Section 7.8.
EEA-45	Describe potential impacts to cultural resources and identify mitigation measures	Sections 10.13, 10.14 and 10.15 discuss potential impacts to historical resources, archaeological resources and the MMNHP (respectively) for the future scenarios.
Sustainable Development and Environmental Management System		
EEA-46	Discuss opportunities for increasing resiliency to the effects of climate change	Climate adaptation and resiliency efforts are described in Section 11.5.4.
EEA-47	Report on status of Massport's Sustainable Development Program	Massport encourages sustainable planning, design, and construction of all development at Hanscom through the use of Massport's Sustainability and Resiliency Design Standards and Guidelines and support for LEED certification (goal of Silver or better) for all development projects greater than 20,000 square feet in size. See Section 11.5.2.
EEA-48	Environmental Management System (EMS)	Environmental Management System details are covered in Section 11.5.1.
EEA-49	Sustainable design program and existing practices at Hanscom	Refer to Section 11.5 which covers "Sustainable Planning, Design, and Construction," "Sustainable Operations and Maintenance," and "Social Sustainability Initiatives" among other topics.
EEA-50	Recycling	Refer to Section 11.5.3, "Recycling."

Comment Number	Comment	Response
EEA-51	Toxics reduction	Hazardous materials and toxics are discussed in Section 11.3.1.
Construction Impacts		
EEA-52	Describe efforts to minimize impacts from construction	Refer to Section 11.5.2, "Sustainable Planning, Design and Construction"
EEA-53	Identify general mitigation measures and measures that could be implemented for specific classes of construction projects	Refer to Section 11.5.2, "Sustainable Planning, Design and Construction"
EEA-54	Identify specific mitigation measures for possible development activities identified in the ESPR	Environmentally Beneficial Measures and specific mitigation measures are discussed in Section 11.6.
EEA-55	Describe community outreach efforts concerning construction	Prior to any temporary period of construction, Massport will develop a project specific Construction-Period Traffic Management Plan to be published and accessible to the HFAC prior to construction, in order to reduce impact as much as possible. When feasible, construction will occur on weekdays between 7:00 AM and 7:00 PM, or as consistent with local noise ordinances. In some circumstances, specialized construction activities may be warranted and require work outside this targeted period. See Section 11.5.2.
Beneficial Measures		
EEA-56	Summarize present and future mitigation commitments/measures	Refer to Section 11.6.
EEA-57	Identify responsible parties, schedule for implementation, estimated costs	Table 11-2 presents environmentally beneficial measures in place at Hanscom, along with the responsible parties, implementation schedule, and the estimated cost (where applicable and data is available) for each measure. Refer to Section 11.6.

Comment Number	Comment	Response
Chris Boles, November 5, 2017		
Airport Planning		
CBO-1	Concerns about Runway 11-29 resurfacing project and construction impacts/potential hazards to Bedford residents	Massport has agreed to develop project-specific Construction-Period Traffic Management Plans that will be shared with the town officials and community, prior to construction. Refer to Section 11.5.2, "Sustainable Construction Measures," for a discussion on Massport's procedures and plans for managing impacts of construction projects, and response to comment EEA-55.
CBO-2	Suggests Massport create a clear and well-considered plan to provide improved access for heavy construction projects so that construction traffic is routed around residential neighborhoods	Prior to construction, a Construction-Period Traffic Management Plan will be developed that will include general project information and details related to work hours, delivery and construction truck routes, worker access and parking plans, police details, truck unloading and staging, construction site signs, modes of transportation for construction workers, and initiatives for reducing driving and parking demands. The plan will also highlight the protection of utilities and the control of noise and dust. This Construction- Period Traffic Management Plan, including the construction vehicle routes and anticipated hours, will be published and available prior to construction. It is expected that a majority of the construction would occur weekdays, typically between 7am and 7pm; some specialized service may require limited nighttime or weekend work. The plan will be reviewed with the Hanscom Field Advisory Commission and the Towns prior to construction. Refer to Section 11.5.2, "Sustainable Construction Measures," and response to comment EEA-55 for more information.
CBO-3	Consider new gate for construction vehicles entering from Hartwell Avenue	Due to federal aviation safety standards, construction traffic cannot be confined to on-airfield routes. Construction access will be adjusted based on the location of any proposed construction. Refer to Section 11.5.2, "Sustainable Construction Measures," and response to comment EEA-55.

Comment Number	Comment	Response
CBO-4	Improved gate entering from Virginia Road	Due to federal aviation safety standards, construction traffic cannot be confined to on-airfield routes. Construction access will be adjusted based on the location of any proposed construction. Refer to Section 11.5.2, "Sustainable Construction Measures," and response to comment EEA-55.
CBO-5	Redesign taxiways to enable flexible routing of construction vehicles	Chapter 4, "Airport Planning" discusses future potential planning scenarios, which are heavily dependent on demand and future activity levels. Due to FAA aviation safety standards, construction traffic cannot be confined to on-airfield routes.
CBO-6	New perimeter road to avoid residential neighborhoods	Due to federal aviation safety standards, construction traffic cannot be confined to on-airfield routes.
Wetlands/Wildlife/Water Resources and Sustainable Development and Environmental Management System		
CBO-7	Monitoring/reporting on leaded fuel use	Leaded fuel use is discussed in Chapter 8, Air Quality. Additional discussion on lead is found in Appendix E.
CBO-8	Monitoring/testing/reporting on hazardous materials in soil/groundwater	Massport complies with all regulations regarding the management of stormwater (Section 2.4.5), management of hazardous materials (2.4.6) and underground tanks, as well as the reporting of any spills and clean-up efforts (2.4.11).
Format/ Other		
CBO-9	Include all technical studies summarized in the ESPR as technical appendices available on the Massport website, separate from ESPR document	Massport provides the technical appendices as separate files available for download on Massport's Environmental Project Filings webpage [http://www.massport.com/massport/about-massport/project-environmental-filings/].
CBO-10	Ensure citizens are informed of comment deadlines and provide timely access to documents for review	Massport provides regular updates on its development activities and project updates at Hanscom Field through monthly HFAC meetings and the annual State of Hanscom reports (Refer to Section 11.5.2). Massport has scheduled and announced dates for two technical workshops and a public meeting during the comment period for the 2017 ESPR to provide an opportunity for public review of the document and input.

Comment Number	Comment	Response
Town of Lexington, November 6, 2017		
LEX-1	Urge MEPA to recognize the importance of Lexington's economic development strategy and require that Massport study the fiscal impact on Lexington of any future changes in use, flight patterns, general, commercial, passenger, or cargo activity level at Hanscom	Section 4.4.3 addresses consistency of the 2017 ESPR with local planning initiatives and regulations.
LEX-2	Suggest Massport include all Lexington intersections identified within the 2012 ESPR study area in the 2017 traffic analysis	Refer to Chapter 6, Ground Transportation for the traffic study intersections. Due to the very low levels of traffic that are contributed by Hanscom Field at many of the intersections included in the 2012 ESPR, consistent with the MEPA scope, the 2017 ESPR focused on the 10 most relevant / impacted intersections.
LEX-3	Evaluate intersections where Hanscom traffic contribute 10-percent or more to existing traffic volumes under future conditions	Refer to Chapter 6, Ground Transportation. Only three intersections met the 10% threshold and those were included in the 10 studied intersections.
LEX-4	Massport to identify/consider all ongoing and potential development projects in surrounding communities in traffic projections	Future increases in weekday, peak hour traffic volumes were estimated for the 2025 and 2035 scenarios and were added to the study area roadway network. The potential increases in traffic volumes include vehicle trips generated by future background growth, or specific, non-Hanscom developments planned or programmed in the area by the towns, as well as forecast activity growth at Hanscom Field. In addition to the components of future traffic growth, Section 6.3 describes planned roadway improvements in the area and their expected effects on the transportation network.
LEX-5	Reducing single occupancy vehicle trips to and from site	Refer to Chapter 6, Ground Transportation which presents the current transportation demand management (TDM) activities in proximity to Hanscom Field, describes current efforts to reduce single occupancy vehicle (SOV) trips to Hanscom, and discusses opportunities for expanding on existing efforts.

Comment Number	Comment	Response
LEX-6	Massport to explore development of Parking and Transportation Demand Management (PTDM) plan	Refer to Chapter 6, Ground Transportation which presents the current transportation demand management (TDM) activities in proximity to Hanscom Field
LEX-7	Massport to consult local Transportation Management Associations (TMAs) and partner with Hanscom AFB, MIT Lincoln Labs, and other employers	Existing, local TMA efforts are described in Section 6.2.3
LEX-8	Analyze impact on environmental resources and environmental quality, including wetlands, wildlife, and floodplain in Lexington	Refer to Chapter 9, Wetlands, Water and Wildlife for a discussion and analysis of current and potential future impacts to water, wetlands and wildlife resources.
LEX-9	Analyze impacts of future Hanscom activity on solar access for public and private property in Lexington	The FAA has published "Technical Guidance for Evaluating Selected Solar Technologies on Airports" as well as the Solar Glare Hazard Tool for determining compatibility of solar projects with aviation activity (to prevent safety issues from glare). The potential for solar installations to create glare for pilots and air traffic controllers depends on a number of factors, including approach patterns of aircraft, runway configuration, size of the solar project and other factors. While Massport does not have jurisdiction to determine whether community solar projects comply with FAA guidance, Massport encourages solar project proponents to refer to this document.

Comment Number	Comment	Response
LEX-10	Conduct baseline noise testing in first calendar quarter of 2018 and ensure that future activity will not exceed the baseline	Refer to Chapter 7, Noise. Hanscom Field has a system of six permanent noise monitors (see Figure 7-10). DNL contours are a graphical representation of how the noise from Hanscom Field's aircraft operations is distributed over the surrounding area on an average day of a given year. 2017 was used as the baseline for the 2017 ESPR. Table 7-9 presents the minimum, the mean, and the maximum total DNL values including all aircraft and ambient noise as measured at each of these locations in 2017; as well as the modeled value at each point for aircraft only. Figure 7-9 depicts noise exposure levels in terms of DNL contours resulting from 2017 operations at Hanscom Field. Forecast increases in general aviation (GA) jet activity contribute to the expected growth in operations, driving a modest projected increase in overall noise levels in the future.
LEX-11	Study and mitigate future effects on physical or aesthetic integrity of heritage resources	Massport recognizes the importance of the environmental and cultural resources in the area surrounding Hanscom and supports the use of the ESPR in presenting existing conditions and minimizing impacts. Chapter 10 Cultural and Historical Resources, provides a comprehensive inventory and analysis of impacts to historic resources in the vicinity of the airfield.
Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program, November 7, 2017		
ESP-1	Updated grassland management plan	Grassland management plan is discussed in Section 9.2.5.
Jennifer Boles, November 8, 2017		
JBO-1	Concerned if Hanscom meets the EPA threshold for lead monitoring as a result of leaded avgas emissions	Hanscom Field does not meet the threshold set by the NAAQS for lead monitoring, and did not meet the lower threshold of 0.5 tons per year for the EPA monitoring study conducted in 2012-2013. See Section 8.2.1.

Comment Number	Comment	Response
JBO-2	Inquiry about heavy metal testing of soils on and near airfield, and testing of wetland sediments on and near airfield. Results of any previous testing and test year. Possibility for current testing	Testing of soils on and near the airfield and wetland sediments was not undertaken in the past and is not required by regulation. Massport does not have plans to begin testing in the future, unless required as part of a specific project action.
JBO-3	Inquiries concerning Runway 11-29 repaving project concerning soil: Were the truckloads of topsoil to restore "disturbed soil" replacing any soil that had been removed? If so, was that soil transported offsite for disposal? Was any soil mixed with pulverized runway millings and taken offsite? If any soil was removed was it tested for heavy metal contamination?	Massport complied with all relevant regulations for the Runway 11-29 repaving project and will continue to comply with all state and federal regulations for future projects.
JBO-4	Inquiries concerning Runway 11-29 repaving project concerning stormwater lines: Did it cause damage to any current or abandoned lines? Was there any spillage into the soil? Was the soil sampled for contaminants? Is it possible that abandoned sewer lines shown in Figure 2-4 of the 2012 ESPR could have been impacted by 11-29 project? Were sewer systems previously used to dispose of solvents, heavy metals, photographic lab or plating lab waste? Do old sewer lines ever leak?	Massport complied with all relevant regulations for the Runway 11-29 repaving project. No stormwater or sewer lines were damaged during construction.

Comment Number	Comment	Response
JBO-5	Explain possibility of negative environmental impacts associated with heavy construction vehicles during Runway 11-29 project. Explain possibility of negative effects on residents/children	The purpose of the ESPR is to serve as a planning document, as opposed to analyzing impacts from individual projects. Massport provides specific analysis of environmental impacts from individual projects in the NEPA and MEPA documents for those projects, as appropriate.
Ann Seamans, November 8, 2017		
SEA-1	Concerned about construction truck trips related to Runway 11-29 project. Inquiry about monitoring air quality during the project, "Was anyone monitoring the air quality on this project?"	Refer to Section 11.5.2, "Sustainable Construction Measures." Federal regulations do not require monitoring of air quality for individual construction projects that are below de minimis levels.
SEA-2	Define Massport and Air Force responsibility for addressing environmental issues	Massport complies with all applicable state and federal environmental regulations for their own facilities. Specific environmental laws and regulations are discussed in the corresponding chapters (for example, the Clean Air Act is discussed in Chapter8 "Air Quality"). Hanscom Air Force Base (AFB), although not a Massport facility or tenant, is in close proximity to Hanscom Field and continues to increase the efficiency and resiliency of facilities on their property, designing to LEED standards when possible. Massport collaborates with the Massachusetts Department of Environmental Protection (MassDEP) and the U.S. Air Force (USAF) to take actions to reduce impacts of Hanscom area activities on the Shawsheen River Watershed. Also, the Air Force is responsible for ongoing remediation of the Superfund site associated with prior military use of Hanscom Field.

Comment Number	Comment	Response
Town of Bedford Board of Selectmen, November 9, 2017		
BED-1	Community impacts of construction required to maintain airfield facilities	Refer to Section 11.5.2, "Sustainable Construction Measures," and response to comment EEA-55. Understanding that there is community interest in construction truck routes, prior to construction, a Construction-Period Traffic Management Plan will be developed that will include general project information and details related to work hours, delivery and construction truck routes, worker access and parking plans, police details, truck unloading and staging, construction site signs, modes of transportation for construction workers, and initiatives for reducing driving and parking demands. The plan will also highlight the protection of utilities and the control of noise and dust. This Construction- Period Traffic Management Plan, including the construction vehicle routes and anticipated hours, will be published and available prior to construction. It is expected that a majority of the construction would occur weekdays, typically between 7am and 7pm; some specialized service may require limited nighttime or weekend work. The plan will be reviewed with the Hanscom Field Advisory Commission and the Towns prior to construction.
BED-2	Need for advanced communication of construction/mitigation efforts	Massport provides regular updates on its development activities and project updates at Hanscom Field through monthly HFAC meetings and the annual State of Hanscom reports. Refer to Section 11.5.2, "Sustainable Construction Measures," and response to comment EEA-55 for specific information related to construction/ mitigation efforts.



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November 16, 2017

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
ESTABLISHING THE SCOPE FOR THE
2017 L. G. HANSCOM FIELD ENVIRONMENTAL STATUS AND PLANNING REPORT

PROJECT NAME : 2017 Hanscom Field Environmental Status and Planning Report
PROJECT MUNICIPALITY : Bedford, Concord, Lexington, and Lincoln
PROJECT WATERSHED : Shawsheen River
EEA NUMBER : 5484/8696
PROJECT PROPONENT : Massachusetts Port Authority (Massport)
DATE NOTICED IN MONITOR : October 10, 2017

As Secretary of Environmental Affairs, I hereby establish the Scope for the 2017 L.G. Hanscom Field Environmental Status and Planning Report (ESPR). The Massachusetts Port Authority (Massport) submitted a Proposed Scope for the ESPR that was consistent with the outline of previous ESPRs.

Background

Hanscom Field comprises approximately 1,300 acres of land, located approximately 20 miles northwest of Boston, within the municipalities of Bedford, Concord, Lexington, and Lincoln. Since 1974, when Massport assumed ownership of the field, it has primarily accommodated private general aviation (GA) activity, commercial, and cargo service. The Federal Aviation Administration (FAA) identifies Hanscom Field as a reliever airport to Logan Airport, whereby Hanscom Field provides substantial airside relief with approximately 165,000 GA operations annually. Hanscom Field also supports limited commercial air service.

Massport has prepared ESPRs in 2000, 2005 and 2012. The ESPR process replaced the preparation and review of Generic Environmental Impact Reports (GEIR) that Massport had prepared for Hanscom starting in 1985. The ESPR process is intended to present an overview of the operational environment and planning status of Hanscom Field and provide long-range projections of environmental conditions against which the effects of future individual projects can be compared. The ESPRs have provided analyses of environmental impacts associated with Hanscom Field activities and considered future conditions based on projected operations. The

ESPRs have included important data on airport facility planning and environmental impacts that are of interest to the surrounding communities and organizations, and have provided a basis for ongoing discussions between Massport and its neighbors. As a result, the documents have served as planning tools to guide Massport in the development of policy and programs.

The ESPR process does not replace MEPA review of specific projects at Hanscom that meet or exceed regulatory thresholds, with the exception of Routine Maintenance and Replacement Projects that are not subject to MEPA review pursuant to 310 CMR 11.01(2)(b)(3). For any project that does exceed thresholds, Massport would be required to submit an Environmental Notification Form (ENF) and, if necessary, an Environmental Impact Report (EIR), that analyzes impacts, reviews alternatives, and identifies measures to avoid, minimize, and mitigate impacts. The ESPR serves as a vehicle for ensuring that long-term, broad-scope planning informs the review and implementation of individual actions at Hanscom Field.

Public Comments

An important purpose of the ESPR is to provide the public with an opportunity to review and comment on information about the environmental impacts associated with the operation and maintenance of Hanscom Field. The Proposed Scope was noticed in the Environmental Monitor on October 10, 2017 and subject to a 30-day public comment period. A public scoping session was held at Hanscom Field on October 24, 2017 in which representatives of the MEPA office and Massport reviewed the ESPR process, the Proposed Scope and subsequent review of documents in MEPA. The scoping session was attended by representatives of the Town of Bedford, representatives of the National Park Service (NPS) Minute Man National Historical Park (MMNHP) and area residents. According to Massport, it will convene up to four technical workshops during the public review process for the ESPR.

I received comments on the proposed Scope from the Town of Lexington and area residents. The ESPR should provide responses to all comments received and incorporate suggestions into the ESPR where appropriate. I note that residents raised concerns about truck traffic and air quality impacts generated by the recent repaving of Runway 11/29. I recommend that Massport consider extending its outreach efforts to better communicate its policies and practices for minimizing and mitigating impacts of construction projects.

Scope

The ESPR should follow the general format of the Proposed Scope and the 2012 ESPR, and provide additional information and analyses specified in this Certificate. It should provide an overview of the ESPR preparation and review process and describe the analytical framework for the studies to be conducted. Detailed technical studies should be summarized in a readable format to illustrate clearly the implications of recent trends, existing conditions and potential future scenarios. To the extent possible, the ESPR should provide the same data used in previous ESPRs to facilitate comparisons.

The ESPR should include an update on Massport's proposed planning initiatives and projects. The ESPR's technical studies should include analyses of airport activity levels, noise, ground access, air quality, wetlands and water quality, wildlife, cultural resources and sustainability under past, current and future conditions. The ESPR should inventory Hanscom's

facilities and infrastructure, summarize Massport's tenant audit program, identify airport activity levels, describe ground transportation, and explain Massport's Environmental Management system. It should provide information on Hanscom's planned role in the future regional transportation system and its projected five-year improvement program. The chapters on ground transportation management, noise, air quality, and wetlands/water resources should include a discussion of analysis methodologies and assumptions; report on 2017 conditions in comparison to previous years, and include projections for 2025 and 2035.

Airport Facilities and Infrastructure

The ESPR should describe the facilities and infrastructure at Hanscom, including their use, ownership, condition and maintenance. It should describe maintenance practices and responsibilities. The ESPR should report on the use and storage of hazardous materials such as jet fuel, and identify measures to minimize and mitigate release of these materials. It should identify areas regulated under M.G.L. 21E, the Massachusetts Contingency Plan (MCP), and provide status reports. The ESPR should report on the past, current and projected water use and wastewater generation, describe water and sewer infrastructure, and detail water conservation measures for equipment, plumbing, and landscape irrigation.

Airport Activity Levels

The 2017 ESPR should report on airport activity levels for 2012 to 2017 and describe the growth forecasts of aviation activity for 2030 and 2035 based on forecasts for all three Massport airports (Logan, Hanscom, and Worcester). The ESPR should use these forecasts to assist in developing fleet projections for each analysis year. Historic airport activity levels should be described. The ESPR should utilize growth forecasts developed for aviation activity for 2025 and 2035 based on recent trends at Hanscom Field and with consideration of the role that the airport plays in the regional airport system. The ESPR should report actual changes in fleet mix and aircraft operations at Hanscom Field and compare this data to the range of future activity levels and fleet mix defined by the moderate growth scenarios of the 2017 ESPR. Differences between actual and previously forecast activity levels should be explained and should be reflected in the underlying assumptions for the 2025 and 2035 forecasts. The forecasts should also include coordination with the Logan Airport ESPR forecasting.

The ESPR should include a 2025 growth scenario for activity levels and passenger forecasts and a 2035 growth scenario for activity levels that vary the fleet mix and passenger forecasts. The fleet mix of the growth scenarios should include GA, military, and commuter service. This scenario should be based on recent trends at the airport as well as regional and national aviation trends.

Airport Planning

The ESPR should identify Massport's planning strategies for operating an efficient airport in an environmentally sensitive manner. It should describe the status of planning initiatives and projects for the Terminal, airside area and landside area. Any projects that may be subject to MEPA review should be identified. The ESPR should report on planning and development initiatives by the MMNHP, the Hanscom Air Force Base, and the four contiguous towns that affect Hanscom Field and are affected by Hanscom Field. According to the Town of Lexington, it is in the process of preparing zoning changes that may increase allowable building

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heights in parts of the town. I recommend that Massport coordinate with the Town to facilitate its planning efforts in a manner that will avoid conflicts with airport operations.

Regional Transportation Context

The ESPR should describe the role of Hanscom Field in the region's transportation system and how Massport plans for and coordinates the use of its three airports. It should provide an update on Massport's efforts to strengthen the regional transportation system and its efforts to promote an efficient regional aviation system with improved public/private transportation access. The ESPR should review:

- Hanscom Field's role in the GA airport network;
- Regional airport operations, passenger activity levels, and any improvements or planned changes plans to the regional airport network;
- Rail service initiatives by others that could affect air passenger travel including Acela Service and bus service;
- The role that Logan International Airport plays in intercity travel choices;
- Diversion opportunities to alternative modes and to other New England airports;
- Efforts to better integrate New England regional airport facilities as a regional system;
- The current status of the ground access improvements at the four New England regional airports (Logan International Airport, T. F. Green Airport, Manchester Airport, and Worcester Regional Airport) by state transportation agencies, including projected dates for completion of studies and/or construction and an analysis to quantify the effects of these measures upon projected passenger levels at each of the airports;
- A report on Massport's efforts to promote service at Worcester and other airports, and
- A report on relevant regional and local highway studies and transit projects.

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Ground Transportation

The ESPR should report on traffic generated by activities at Hanscom and any impacts on the local roadway network. The traffic analysis should be prepared in accordance with the EEA/MassDOT Guidelines for Traffic Impact Assessment. The analysis should document actual trips and projected growth in trips attributed to Hanscom Field as compared to background growth and projected increases from other area sources. The analysis should be conducted for a study area bounded by Route 2A, Old Bedford Road, Route 62, Routes 4/225 and Route 128/I-95. It should evaluate existing and projected traffic operations for at least 10 intersections in the study area, including those where the 2012 ESPR determined that Hanscom Field contributed 10 percent or more of the traffic volume. Existing and projected trip generation should be compared to trip data used in previous ESPRs and trends should be identified.

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The ESPR should describe trips taken by employees and visitors to Hanscom and note any changes in travel patterns based on available data. It should describe any existing public transportation or shuttle service to Hanscom or nearby locations. It should detail Transportation Demand Management (TDM) measures implemented at Hanscom to reduce single-occupancy vehicle (SOV) trips to and from the site, identify any additional TDM measures under consideration, and describe how the success of each measure will be evaluated. The ESPR should describe the potential formation of a Transportation Management Association (TMA) and how it could reduce SOV trips to the site.

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Noise

The ESPR should report on noise levels generated by air traffic operating in and out of Hanscom Field. Massport maintains six permanent noise monitoring stations at Hanscom from which data will be collected. Massport will use Aviation Environmental Design Tool (AEDT) to model its noise impacts in place of the Integrated Noise Model used in past ESPRs. The ESPR should review the methodology for collecting and analyzing noise level data, and compare current conditions to noise levels reported in the 2012 ESPR and to projected noise levels. It should describe any resulting changes to the analysis or interpretation of noise levels based on the use of AEDT. The ESPR should provide updated Noise Exposure (EXP) reference levels calculated in accordance with FAA guidelines; Day-Night Average Sound Level (DNL) contours for 55, 60, 65 and 70 decibels (dBA); and Time-Above (TA) contours showing 30, 60 and 90 minutes of exposure for 55 and 65 dBA contours. Based on the new noise level contours and population data from the 2010 Census, the ESPR should calculate the number of residents within each noise level scenario. It should provide a focused analysis of noise levels in areas affected by noise from aircraft upon start-up and take-off roll. The ESPR should describe all noise mitigation measures implemented at Hanscom, including the Fly Friendly program and the recommended "touch and go" procedures over the MMNHP. The ESPR should describe the MMNHP soundscape plan, and how aircraft operations at Hanscom affect it.

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Air Quality

The ESPR should report on air quality conditions for the year 2017 and actual and projected emissions based on forecasted activity levels. The ESPR should provide an emissions inventory for the following pollutants:

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- Carbon Monoxide (CO)
- Oxides of Nitrogen (NO_x)
- Volatile Organic Compounds (VOCs)
- Particulate matter (PM₁₀ and PM_{2.5})
- Greenhouse Gases (GHG)

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The ESPR should also provide monitoring results for ozone precursors and nitrogen dioxide (NO₂). The ESPR should describe all mitigation measures implemented to minimize emissions of air pollutants. It should update the 2012 ESPR summary of the state of leaded fuel in aviation and provide the latest information on the percentage of the Hanscom fleet that uses leaded fuel. The ESPR should summarize any recent aircraft leaded fuel studies, ongoing work on unleaded fuel alternatives for aircraft and provide an update on FAA's program to phase out the use of LL100. It should provide an update on aviation industry studies pertaining to ultrafine particulate matter (UFP) issues.

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The ESPR should establish the base level of GHG emissions against from which emissions reductions will be measured. The 2017 ESPR should report on measures to reduce on-site emissions from all sources, including fuel handling, ground service equipment, transportation and building heating and cooling. It should report on Massport's efforts to minimize GHG emissions, including those undertaken by fixed base operators.

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Wetlands/Wildlife/Water Resources

The ESPR should discuss and provide maps of the most recent delineation of wetlands and vernal pools. It should include maps of rare species habitat as depicted on the Massachusetts Natural Heritage and Endangered Species Program's (NHESP) Natural Heritage Atlas (14th Edition) released on August 1, 2017. The Great Meadow National Wildlife Refuge and other significant nearby areas of wetland and wildlife habitat should be identified on maps of natural resource areas to provide context. The ESPR should include an update of Massport's Vegetation Management Program and the Hanscom Field Grassland Management Program.

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The ESPR should report on any incremental changes to the Hanscom Field stormwater management system and to its Storm Water Pollution Prevention Plan (SWPPP), including Best Management Practices (BMPs). The ESPR should identify changes to the impervious areas at Hanscom Field between 2012 and 2017 and estimate changes in impervious area based on the 2025 and 2035 growth scenarios and airport planning.

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Cultural and Historical Resources

The 2017 ESPR should review the existing data on historic and archeological resources within or adjacent to Hanscom Field, including the MMNHP. The ESPR should identify cultural resources listed in the State Register of Historic Places and/or the files of the Massachusetts Historical Commission (MHC) and local historical commissions or described in previous planning studies. The ESPR should report on any changes to the MMNHP soundscape plan and goals and review coordination efforts between Massport and the NPS. It should describe potential impacts to cultural resources and identify mitigation measures.

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Sustainable Development and Environmental Management System

Governor Baker signed Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth (EO 569) on September 16, 2016. The Order recognizes the serious threat presented by climate change and directs agencies within the administration to develop and implement an integrated strategy that leverages state resources to combat climate change and prepare for its impacts. The Order seeks to ensure that Massachusetts will meet GHG emissions reduction limits established under the Global Warming Solution Act of 2008 (GWSA) and will work to prepare state government and cities and towns for the impacts of climate change. A statewide climate change adaptation plan will be prepared and agencies will conduct vulnerability assessments. Using the best available information and data on observed and projected climate trends and impacts, the state plan will provide clear guidance and strategies to proactively address these impacts through adaptation and resiliency measures and will highlight approaches for ensuring that adaptation and resiliency efforts complement efforts to reduce GHG emissions and conserve and sustainably employ the natural resources of the Commonwealth.

Future weather conditions are expected to include periods of drought, tropical rainfall patterns, and extreme heat and cold stretches, and increases in the number of days with extreme heat (over 90 degrees F and 100 degrees F). The ESPR should discuss opportunities for increasing Hanscom Field's resiliency to the effects of climate change, such as high-performance Heating, Ventilation and Air Conditioning (HVAC) systems that function efficiently under projected future conditions; high albedo roofing materials; pervious pavement; reuse of non-potable water for irrigation; on-site energy generation, including a combined heat and power

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(CHP) system and solar photovoltaic systems; retaining stormwater from the 1-inch precipitation event; stormwater infrastructure designed for short-duration, high-intensity precipitation events; landscaping with native, drought-resistant plants; installation of backflow preventers on connections to the sanitary sewer system.

The ESPR should report on the status of Massport's Sustainable Development Program and its Environmental Management System (EMS Program). It should describe Massport's environmental goals and the monitoring procedures and roles and responsibilities it uses to track and manage the environmental performance of Hanscom Field. The ESPR should include a discussion of the following:

- Sustainable design program and practices employed at Hanscom Field;
- Recycling policy and efforts;
- Toxics reduction; and
- Opportunities and planning efforts to encourage sustainable development practices.

The ESPR should discuss the potential for incorporating other sustainable design elements into airport operations and/or the ongoing rehabilitation and expansion of existing airport facilities, such as optimizing natural day lighting, passive solar gain, and natural cooling and using building supplies and materials that are non-toxic, made from recycled and made with low embodied energy.

Construction Impacts

As noted earlier, several comment letters were focused on the impacts caused by the Runway 11-29 resurfacing project. According to commenters, noise and air quality impacts were caused by heavy truck traffic on residential streets during the construction period. Concern was also expressed as to the manner that potentially hazardous material, such as milled asphalt, was removed and transported from the site.

The ESPR should generically describe Massport's efforts to minimize impacts from construction activities at Hanscom Field. It should identify general mitigation measures and, where possible, measures that could potentially be implemented for specific classes of construction projects. Potential mitigation measures should be identified for any possible development activities identified through airport planning efforts and presented in the ESPR. The ESPR should describe Massport's outreach efforts to notify local officials and residents of significant construction projects.

Beneficial Measures

The ESPR should summarize Massport's mitigation commitments, such as TDM, noise abatement, and sustainability measures. This chapter should include the identification of the parties responsible, a schedule for implementation, and the estimated costs. The ESPR should describe any additional mitigation measures that may be considered in the future.

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Response to Comments

The 2017 ESPR should contain a copy of this Certificate and a copy of each comment letter received on the Proposed Scope and the 2012 ESPR. In order to ensure that the issues raised by commenters are addressed, the ESPR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended to, and shall not be construed to, enlarge the Scope of the 2017 ESPR beyond what has been expressly identified in this Certificate.

Circulation

The ESPR should be circulated in compliance with Section 11.16 of the MEPA regulations. Copies should be sent to those parties who commented on the Proposed Scope and 2012 ESPR. Massport should send a Notice of Availability of the 2017 ESPR to its mailing list for Hanscom Field. Copies should also be provided to the Bedford, Concord, Lexington and Lincoln public libraries.

Conclusion

The ESPR should include a copy of this Certificate. It should include copies of all comments received on the Proposed Scope and the 2012 ESPR and provide responses to the comments. It should include all Supporting Technical Appendices or report how reviewers can obtain a copy. The ESPR should identify when Massport will submit interim review documents, such as Annual Reports. The documents should be made available in print, CD-ROM format, and/or in a downloadable format from a website.

November 16, 2017

Date

Matthew A. Beaton

Comments received:

11/05/2017	Chris Boles
11/06/2017	Lexington Board of Selectmen
11/07/2017	Natural Heritage and Endangered Species Program (NHESP)
11/08/2017	Jennifer Boles
11/08/2017	Ann Seamans
11/09/2017	Mike Rosenberg

MAB/AJS/ajs

Comments on the Proposed Scope 2017 L. G. Hanscom Environmental Status & Planning Report

Chris Boles, Bedford Resident

243 Concord Rd., Bedford, MA 01730

Dear Massport and MEPA officials:

Please find below my comments on the ESRP scoping document, in order of importance.

CBO-1

Section IV. Airport Planning

As a major regional airport, Hanscom Field will require continuing capital improvement, development, and maintenance projects. While such projects are essential to Massport's function at Hanscom Field, at least one recent capital maintenance project, the runway 11-29 resurfacing project, has run rough-shod over the well-being of Bedford citizens, by conducting more than 12,000 heavy construction vehicle trips through Bedford residential neighborhoods.

Moreover, many of the construction loads consisted of hazardous material such as milled asphalt, which is known to contain respirable silica, a substance associated with increased cancer risk. Furthermore, much of the material trucked through Bedford was removed from locations close to known EPA superfund sites (OU-1, sites 1, 2, and 3). For this reason, such activity should have been considered potentially hazardous to Bedford citizens, at a minimum. Our inquiries about the potential hazards from such trucking activity have been answered by dismissive, insubstantial reassurances from Massport, and have not provided any actual testing data on the potential hazards to Bedford neighborhoods. (And I am speaking here about neighborhoods with many small children and playing fields for youths in close proximity to the truck routes.) In my opinion, such precautionary testing should have been required by the EPA and MEPA well in advance of the 11-29 runway resurfacing project.

The lessons from the 11-29 resurfacing project that are important for the Massport ESRP scoping process are clear: **there needs to be a clear and well-considered plan to provide improved access for heavy construction projects at Hanscom Field that does not involve travel through residential neighborhoods of the Hanscom area towns, especially Bedford.**

CBO-2

I wish to be clear that I am not opposed to further development at Hanscom Field. However, such development must be carried out in a manner that protects the health and safety of the citizens of Bedford, and the other Hanscom communities.

Plans for improved access for construction projects might consider the following options:

- 1) A new gate for construction vehicles entering from Hartwell Avenue along the east border of the field, at a point somewhere northeast of the Air Force base.
- 2) An improved gate for construction traffic on the southwest perimeter of the field entering from Virginia Road, where a couple of gates to the perimeter service road already exist.
- 3) Redesign of existing taxiways and/or construction of new taxiways that would allow more flexible routing of construction vehicles with minimal disruption of normal airport operations.
- 4) Improvements to, or construction of, a new perimeter road within existing Massport property lines to provide better construction access from gates not involving Bedford residential neighborhoods.

CBO-3

CBO-4

CBO-5

CBO-6

Section IX. Wetlands/Wildlife/Water resources; and Section XI. Sustainable Development and Environmental Management System

Because of the specialized chemicals in use at airports, there is a need for special environmental monitoring. For instance, it is my understanding that a substantial fraction of the aircraft fuel used at Hanscom Field is leaded. In addition, there are components of specialty chemicals used at airports, such as deicing chemicals, that may be hazardous to the ecosystem and humans. Although, water quality monitoring of the Shawsheen River is an important activity supported by Massport, it would seem to be valuable to also monitor soils and groundwater for commonly used hazardous materials at Hanscom Field. This would seem to be easy to address at Hanscom Field, since many such monitoring procedures are already in place due to the Superfund cleanup activities. I think that such a testing program should be considered for inclusion in the ESPR.

CBO-7

CBO-8

Format of the 2017 ESPR

Page 2 of the scoping document states that:

“Detailed ESPR technical studies will be summarized in a readable format to illustrate clearly the implications of recent trends, existing conditions and potential future scenarios.”

CBO-9

Since Massport is an agency of the Commonwealth of Massachusetts, all technical studies used to produce the ESPR should be publically available to the citizens of the Commonwealth. Summaries of the technical data in the ESPR are useful and essential, but at this point in history, where electronic document storage costs are so low, all of the technical data used for the ESPR should be made available as technical appendices that can be downloaded from the Massport website separately from the main ESPR document.

A minor comment about the ESPR scoping review process –

Although dated October 2nd, the document was not publically available for download from the Massport website until sometime after October 20th. I downloaded it on October 23rd. For this reason, the actual period for public comment on the scoping document was around 19 days, instead of the stated 30 day period. Massport should do better in future to inform citizens of such deadlines, and provide easy and **timely** access to the relevant documents to be reviewed.

CBO-10

Thank you for meeting with the Hanscom communities to discuss the ESPR scoping document on October 24th, and also for soliciting public comments on these important issues.

Sincerely,



Chris Boles
11/5/2017



Town of Lexington
Office of Selectmen

Suzanne E. Barry, Chairman
Michelle L. Ciccolo, Vice Chairman
Peter C. J. Kelley
Joseph N. Pato
Douglas M. Lucente

Tel: (781) 698-4580
Fax: (781) 863-9468

November 6, 2017

Secretary of Energy and Environmental Affairs
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office
Alex Strysky, EEA No. 5484/8696
100 Cambridge Street, Suite 900
Boston MA 02114

RE: Proposed Scope 2017 L. G. Hanscom Field Environmental Status & Planning Report
Bedford, MA, EEA Number: 5484/8696

Dear Mr. Strysky:

This letter is to provide formal comments on the proposed scope for Hanscom Field's Environmental Status and Planning Report (ESPR). We note that the ESPR will include analysis of airport activity levels, noise, ground access, air quality, water quality, natural resources, cultural and historical resources, and sustainability.

We note that the 1978 Hanscom Master Plan and the 1980 Noise Rules allow for passenger aircraft with up to 60 seats, and the fleet mix growth scenarios for 2025 and 2035 include general aviation, military, commuter service cargo activity.

In analyzing future conditions and activity through the 2017 ESPR update, we request that MEPA require Massport to study the following:

- 1. Expansion of Development in Lexington/Avigation Easement**
- 2. Traffic and Transportation**
- 3. Environmental & Noise Impacts**
- 4. Impact on Historic Resources**

The following provides further detail on the scope of study we urge MEPA to require of Massport in its 2017 ESPR update.

Expansion of Development in Lexington/Aviation Easement

The Town is in the process of preparing zoning changes to bring to its legislative body, Annual Town Meeting, in the spring of 2018 that would increase the allowable building heights, development densities, and uses (including residential within mixed-use) on Bedford Street between the I-95 interchange and just west of Hartwell Avenue, along Hartwell Avenue and on Maguire Road. This locus was strategically selected for increased heights to avoid conflicts with the aviation easement. The Town is aware that Stantec has prepared more detailed aviation easement map data, however it has not been provided to us in response to our requests. We urge that MEPA recognize the importance of Lexington's economic development strategy and require that Massport study the fiscal impact on Lexington of any future changes in use, flight patterns, general, commercial, passenger, or cargo activity level at Hanscom.

LEX-1

Traffic and Transportation

We request that MEPA require Massport to include in their traffic analysis, all of the Lexington intersections, several of which are located along the Battle Road Scenic Byway, that were identified in the 2012 ESPR designated study area. In addition, we ask that all intersections be evaluated where Hanscom Field traffic is projected to contribute 10-percent or more to the existing traffic volumes on each intersection approach. This method should be used to evaluate intersections under both projected 2025 and 2035 conditions.

LEX-2

LEX-3

With regard to background growth and capturing other "No-Build" activity, we ask that Massport work closely with Lexington, as well as other surrounding communities, to identify all ongoing and potential development projects in the area. The Town of Lexington is currently exploring options to up-zone a portion of Hartwell Avenue and Bedford Street (Rte. 4/225), the Minuteman Regional Vocational Technical School is moving forward with plans to reconstruct their existing facility and MassDOT has expressed interest in possibly reconfiguring the existing Route 2A interchanges at Route 128/I-95 with roundabouts. These are just a few projects, all of which should be considered for factoring into future traffic projections.

LEX-4

LEX-5

The study should also consider all modes of transportation, including but not limited to transit, carpooling, vanpooling, pedestrian, bicycle and autonomous vehicles with an overall goal of reducing single occupancy vehicle trips to and from the site. Lexington requests that MEPA require Massport to explore the development of a Parking and Transportation Demand

LEX-6

Management (PTDM) plan as well as identify steps to implement it. Massport should consult local Transportation Management Associations (TMAs) as well as explore ways to partner with Hanscom AFB, MIT Lincoln Labs and other large area employers.

LEX-7

Environmental & Noise Impacts

LEX-8

We urge that MEPA require Massport to analyze the impact on environmental resources and environmental quality, including wetlands, wildlife, and floodplain in Lexington. Further, we urge that MEPA require that the impacts of future Hanscom activity on solar access for public and private property in Lexington be analyzed. We ask that MEPA require Massport to agree on a baseline noise testing methodology and to conduct the baseline noise testing in the first calendar quarter of 2018, and that future activity will not exceed the baseline.

LEX-9

LEX-10

Impact on Historic Resources


The Minuteman National Historical Park, the Battle Road Scenic Byway, and one or more National Register of Historic Places-designated or Register-eligible sites are within or near Hanscom Field. MEPA should require that Massport study and plan to mitigate or avoid future structures, activities, and infrastructure that could affect the physical or aesthetic integrity of these heritage resources.

LEX-11

In conclusion, the Board requests that MEPA recognize through its scope that the Town has important near-term and long-range development plans and quality of life concerns for residential and commercial property owners and visitors who support our tourism economy. We appreciate the opportunity to help MEPA determine the scope of analysis that Massport will perform in its 2017 update to the ESPR.

Thank you for the opportunity to comment.

Sincerely,


Suzanne E. Barry
Chair, Board of Selectmen

cc: Lexington Planning Board/Department

Strysky, Alexander (EEA)

From: Schluter, Eve (FWE)
Sent: Tuesday, November 07, 2017 12:57 PM
To: Strysky, Alexander (EEA)
Cc: Holt, Emily (FWE)
Subject: RE: Hanscom field ESPR (NHESP # 01-9192)

Hi Alex,

We have reviewed the "Proposed Scope 2017 L.G. Hanscom Field Environmental Status & Planning Report". We have no comments at this time as MESA-related concerns appear to be covered under Section IX (Wetlands/Wildlife/Water Resources). As stated below, we look forward to reviewing the updated grassland management plan.

ESP-1

Thanks, Eve

Everose Schlüter
Chief of Regulatory Review
Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6346 | f: (508) 389-7890
www.mass.gov/nhesp | facebook.com/masswildlife

From: Strysky, Alexander (EEA)
Sent: Friday, March 07, 2014 3:54 PM
To: Schluter, Eve (FWE)
Subject: RE: Hanscom field ESPR (NHESP # 01-9192)

Thanks, Eve.

Alex Strysky
MEPA Office
100 Cambridge Street, 9th Floor
Boston, MA 02114

ph: (617) 626-1025
fx: (617) 626-1181

From: Schluter, Eve (FWE)
Sent: Friday, March 07, 2014 3:29 PM
To: Strysky, Alexander (EEA)
Cc: Dalzell, Stewart; Holt, Emily (FWE)
Subject: Hanscom field ESPR (NHESP # 01-9192)

Hi Alex,

The NHESP has reviewed the 2012 L.G. Hanscom Field Environmental Status and Planning report (ESPR). We do not have any comments or concerns at this time. As described in the document, any work within Priority Habitat would need to be filed with our office and would be subject to MESA review. We also look forward to working with the Proponent on reviewing an updated Grassland Management Plan when the time comes.

Please let me know if you have any questions.

Thanks, Eve

Everose Schlüter, PhD

Senior Endangered Species Review Biologist

Natural Heritage & Endangered Species Program

Massachusetts Division of Fisheries and Wildlife

PLEASE NOTE NEW FIELD HEADQUARTERS ADDRESS (Phones and Emails have not changed.)

100 Hartwell Street, Suite 230

West Boylston, MA 01583

Voice: (508) 389-6346

Fax: (508) 389-7890

www.mass.gov/nhesp

Strysky, Alexander (EEA)

From: Jennifer Boles <ijcb3@verizon.net>
Sent: Wednesday, November 08, 2017 11:44 PM
To: Strysky, Alexander (EEA)
Cc: agoodspeed@massport.com
Subject: Public Comment and Questions for 2017 Hanscom ESPR Proposed Scope

Dear Mr. Strysky,

I am a Bedford resident who lives near Hanscom Field, and I would like to submit some comments and questions regarding the 2017 Massport Hanscom ESPR Scoping Report for the public record.

1. Whether or not Hanscom Airport meets the current EPA threshold of estimated leaded avgas emissions to trigger lead monitoring of the air, it is highly probable that it would have met or exceeded that threshold for many years of its past, when the air traffic was much heavier. Although perhaps the exhaust emissions presently do not qualify for air quality monitoring, what about the lead and other heavy metals, including arsenic, contained in avgas exhaust that have accumulated in airfield soil for many decades? Has heavy metal testing of soils on and near the airfield, and wetland sediments on and near the airfield, ever been undertaken in a comprehensive way? If so, how long ago and what were the results? If not recently or at all, can it be done now?

JBO-1

2. The RFP for the recent Repaving of Runway 11/29 called for many truckloads of loam(topsoil) to restore "disturbed areas". Was it replacing any soil that had been removed? If so, was that soil transported offsite for disposal? Was any soil mixed with the pulverized runway millings and taken offsite? If any soil was removed, whether mixed in with the old asphalt or in separate truckloads, was it sampled to test for heavy metal contamination?

JBO-2

3. Did the recent Repaving of Runway 11/29 damage any sewer or water or storm drain lines that cross the airfield (either in current use or older abandoned lines)? If so, was there any spillage into the soil? If so, was that soil sampled for contaminants or removed or reburied?

JBO-3

There is a 1986 Navy document (Initial Assessment Study of Naval Weapons Industrial Reserve Plant Bedford, Massachusetts, NEESA 13-099, Navfac Environmental Admin Records website) that mentions the Naval Flight Test Facility sewer line was connected to the Air Force sewer system. Is it possible that old abandoned sewer line is the one shown connecting with the FamCamp and Air Force sewer line which crosses beneath Runway 11/29 in Figure 2-4 of the 2012 Hanscom Field Environmental Status and Planning Report? Is there any evidence the Navy sanitary sewer systems were used in the past to dispose of solvents, heavy metal containing acids, or photographic lab or plating lab waste? Do old sewer lines ever leak?

JBO-4

4. Could the 12,000+ heavy construction vehicles running through Bedford neighborhood streets 24/7 for 6 weeks for the recent Massport Hanscom Runway 11/29 Project have had any negative environmental impact on Bedford residents either living on the Haul Route, or stuck in the traffic jams the trucks created? No negative effects on the children and youths on the adjacent playing fields along the Haul Route at South Road and Hartwell Road?

JBO-5

Thank you for considering these questions.

Sincerely,
Jennifer Boles
243 Bedford Road
Bedford, MA 01730

Strysky, Alexander (EEA)

From: Ann <annseamans@aol.com>
Sent: Wednesday, November 08, 2017 9:58 PM
To: Strysky, Alexander (EEA)
Subject: environmental effects of August Massport project

Dear Mr. Strysky, I live on Concord Road, Bedford. During the month of August 2017, I was affected by the 12,000 truck trips with extremely noisy trucks sometimes using jake breaks, in front of my house, which was 1 house away from where gigantic trucks turned onto Hartwell Ave; however, for me the scariest night came when I woke up gasping for breath, eyes running and thought the house was on fire. It wasn't so I opened the door to see what was happening and the toxic air was overwhelming, causing me to get my asthma inhaler and call the police to not only complain about gigantic noisy round the clock trucks speeding by but also mention my difficulty breathing. He offered to send EMTs to take me to hospital. Very scary time as my asthma is usually under control these days. Was anyone monitoring the air quality on this project?



SEA-1

Also, in terms of addressing environmental issues, as an ordinary citizen of Bedford, it is unclear which agency is responsible for managing these issues, Massport or the Air Force. Apparently we've been told the Air Force addresses super fund site issues such as runway asphalt breaches and Massport deals with sewer problems, for example. On more than one occasion we call one agency only to be told, "No. We don't deal with that. The other agency does," which makes it difficult to ask questions and get resolutions. Who ultimately has responsibility?



SEA-2

Thank you for your considerations of my concerns about accountability for environmental issues. Ann Seamans

Sent from my iPad

TO: Massachusetts Port Authority

RE: Scope of 2017 Hanscom Field ESRP

Several neighborhoods in the Town of Bedford were literally traumatized throughout August of 2017 by thousands of dump trucks traversing residential streets, servicing the resurfacing of the long runway at Hanscom Field.

I recognize the need to maintain airfield facilities, and that sometimes impact on the contiguous towns is unavoidable. However, the impact on those communities should be anticipated, with advance communication to mitigate impact.

BED-1

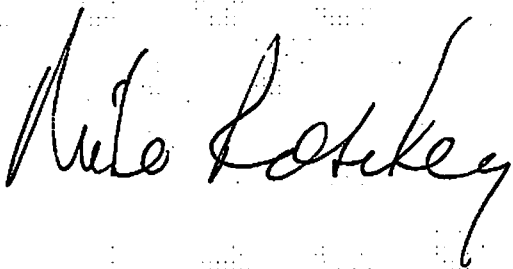
BED-2

I could not find any reference to this approach in the ESRP proposed scope, and I urge that these provisions be considered.

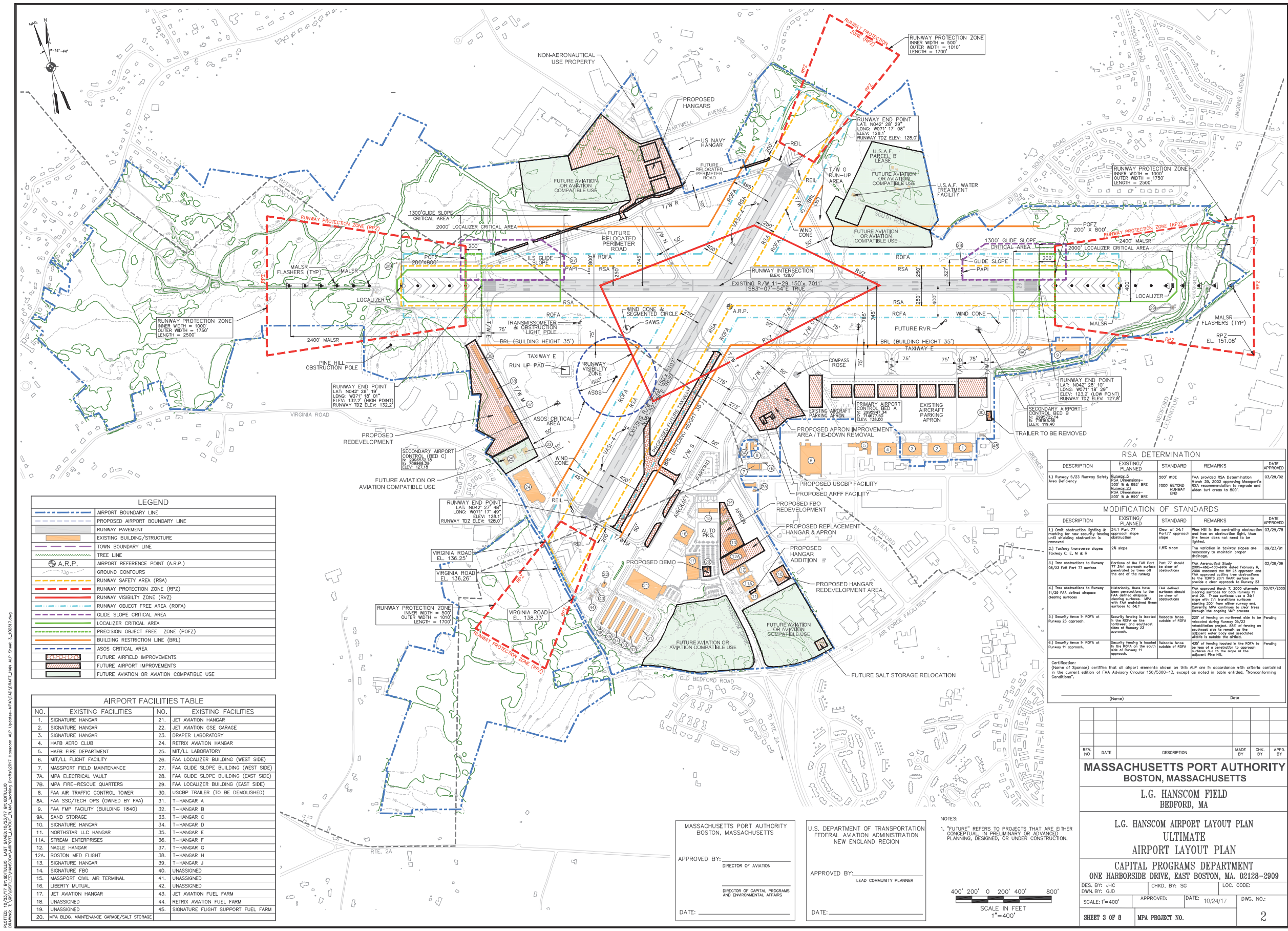
Mike Rosenberg

Bedford selectman

Chair, Hanscom Field Advisory Commission

A handwritten signature in black ink, appearing to read "Mike Rosenberg", written in a cursive style.

Appendix B - Airport Layout Plan



LEGEND	
	AIRPORT BOUNDARY LINE
	PROPOSED AIRPORT BOUNDARY LINE
	RUNWAY PAVEMENT
	EXISTING BUILDING/STRUCTURE
	TOWN BOUNDARY LINE
	TREE LINE
	AIRPORT REFERENCE POINT (A.R.P.)
	GROUND CONTOURS
	RUNWAY SAFETY AREA (RSA)
	RUNWAY PROTECTION ZONE (RPZ)
	RUNWAY VISIBILITY ZONE (RVZ)
	RUNWAY OBJECT FREE AREA (ROFA)
	GLIDE SLOPE CRITICAL AREA
	LOCALIZER CRITICAL AREA
	PRECISION OBJECT FREE ZONE (POFZ)
	BUILDING RESTRICTION LINE (BRL)
	ASOS CRITICAL AREA
	FUTURE AIRFIELD IMPROVEMENTS
	FUTURE AIRPORT IMPROVEMENTS
	FUTURE AVIATION OR AVIATION COMPATIBLE USE

AIRPORT FACILITIES TABLE			
NO.	EXISTING FACILITIES	NO.	EXISTING FACILITIES
1.	SIGNATURE HANGAR	21.	JET AVIATION HANGAR
2.	SIGNATURE HANGAR	22.	JET AVIATION GSE GARAGE
3.	SIGNATURE HANGAR	23.	DRAPER LABORATORY
4.	HAFB AERO CLUB	24.	RETRIX AVIATION HANGAR
5.	HAFB FIRE DEPARTMENT	25.	MIT/LL LABORATORY
6.	MIT/LL FLIGHT FACILITY	26.	FAA LOCALIZER BUILDING (WEST SIDE)
7.	MASSPORT FIELD MAINTENANCE	27.	FAA GLIDE SLOPE BUILDING (WEST SIDE)
7A.	MPA ELECTRICAL VAULT	28.	FAA GLIDE SLOPE BUILDING (EAST SIDE)
7B.	MPA FIRE-RESCUE QUARTERS	29.	FAA LOCALIZER BUILDING (EAST SIDE)
8.	FAA AIR TRAFFIC CONTROL TOWER	30.	USCPB TRAILER (TO BE DEMOLISHED)
8A.	FAA SSC/TECH OPS (OWNED BY FAA)	31.	T-HANGAR A
9.	FAA FMP FACILITY (BUILDING 1840)	32.	T-HANGAR B
9A.	SAND STORAGE	33.	T-HANGAR C
10.	SIGNATURE HANGAR	34.	T-HANGAR D
11.	NORTHSTAR LLC HANGAR	35.	T-HANGAR E
11A.	STREAM ENTERPRISES	36.	T-HANGAR F
12.	NAGLE HANGAR	37.	T-HANGAR G
12A.	BOSTON MED FLIGHT	38.	T-HANGAR H
13.	SIGNATURE HANGAR	39.	T-HANGAR J
14.	SIGNATURE FBO	40.	UNASSIGNED
15.	MASSPORT CIVIL AIR TERMINAL	41.	UNASSIGNED
16.	LIBERTY MUTUAL	42.	UNASSIGNED
17.	JET AVIATION HANGAR	43.	JET AVIATION FUEL FARM
18.	UNASSIGNED	44.	RETRIX AVIATION FUEL FARM
19.	UNASSIGNED	45.	SIGNATURE FLIGHT SUPPORT FUEL FARM
20.	MPA BLDG. MAINTENANCE GARAGE/SALT STORAGE		

RSA DETERMINATION				
DESCRIPTION	EXISTING/PLANNED	STANDARD	REMARKS	DATE APPROVED
1) Runway 5/23 Runway Safety Area	EXISTING	500' WIDE	FAA provided RSA Determination March 20, 2003 approving Massport's RSA recommendation to regrade and when turf comes to 200'	03/29/02

MODIFICATION OF STANDARDS				
DESCRIPTION	EXISTING/PLANNED	STANDARD	REMARKS	DATE APPROVED
1) Obstruction lighting and marking for new security fencing unit including obstruction is removed	341 Part 77	Clear of 341 Part 77 approach slope	Since HIL is the controlling obstruction and has an obstruction light, the fence does not need to be lighted.	03/29/02
2) Taxiway transverse slopes	2% slope	1.5% slope	The variation in taxiway slopes are necessary to maintain proper drainage.	06/23/01
3) Tree obstructions to Runway 05/23 FAA Part 77 surface	Part 77	Part 77 should be clear of obstructions	FAA Aeronautical Study 2005-04C-102-040 dated February 6, 2006 assessed the RM 23 approach and FAA approved existing tree obstructions to the 1200' 201' MPA surface to provide a clear approach to Runway 23	02/08/06
4) Tree obstructions to Runway 17/28 FAA defined clearance surfaces	Historically, there have been obstructions to the 341' slope with 21' clearance surfaces. MPA with FAA registered these surfaces to 341'	FAA defined clearance surfaces should be clear of obstructions	FAA approved March 7, 2000 alternate clearing surfaces for both Runway 17 and 28. These surfaces are a 341' slope with 21' clearance surfaces. MPA with FAA registered these surfaces to 341' through the ongoing MAP process	03/07/2000
5) Security fence in ROFA at Runway 23 approach	Security fence in ROFA at Runway 23	Relocate fence outside of ROFA	220' of fencing on northeast side to be relocated during Runway 05/23 reconstruction project. 800' of fencing on southeast side to be relocated and adjacent water body and associated depths to be suitable for the project.	Pending
6) Security fence in ROFA at Runway 11 approach	Security fence in ROFA at Runway 11	Relocate fence outside of ROFA	430' of fencing located in the ROFA to be relocated to approach surface due to the slope of the adjacent Pine Hill.	Pending

Certification:
(Name of Sponsor) certifies that all airport elements shown on this ALP are in accordance with criteria contained in the current edition of FAA Advisory Circular 150/5300-13, except as noted in table entitled, "Nonconforming Conditions".

(Name) _____ Date _____

REV. NO.	DATE	DESCRIPTION	MADE BY	CHK. BY	APPR. BY

MASSACHUSETTS PORT AUTHORITY
BOSTON, MASSACHUSETTS

L.G. HANSCOM FIELD
BEDFORD, MA

L.G. HANSCOM AIRPORT LAYOUT PLAN
ULTIMATE
AIRPORT LAYOUT PLAN

CAPITAL PROGRAMS DEPARTMENT
ONE HARBORSIDE DRIVE, EAST BOSTON, MA 02128-2909

DES. BY: JHC
DWN. BY: GJD

CHKD. BY: SG

LOC. CODE:

APPROVED: _____ DATE: 10/24/17 DWG. NO. _____

SHEET 3 OF 8 MPA PROJECT NO. _____

2

MASSACHUSETTS PORT AUTHORITY
BOSTON, MASSACHUSETTS

APPROVED BY: _____
DIRECTOR OF AVIATION

APPROVED BY: _____
DIRECTOR OF CAPITAL PROGRAMS
AND ENVIRONMENTAL AFFAIRS

DATE: _____

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
NEW ENGLAND REGION

APPROVED BY: _____
LEAD COMMUNITY PLANNER

DATE: _____

NOTES:
1. "FUTURE" REFERS TO PROJECTS THAT ARE EITHER CONCEPTUAL, IN PRELIMINARY OR ADVANCED PLANNING, DESIGNED, OR UNDER CONSTRUCTION.

400' 200' 0 200' 400' 800'

SCALE IN FEET
1"=400'

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Appendix C — Ground Transportation

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Appendix C-1

2018 Hanscom Field Travel Questionnaire

2018 Hanscom Field Environmental Status and Planning Report Commute/Travel Questionnaire

1. Where did your trip to Hanscom Field originate today?

Answer Choices	Responses	
City	100.00%	61
State	100.00%	61
Zip	98.36%	60
Answered		61
Skipped		1

Responses:

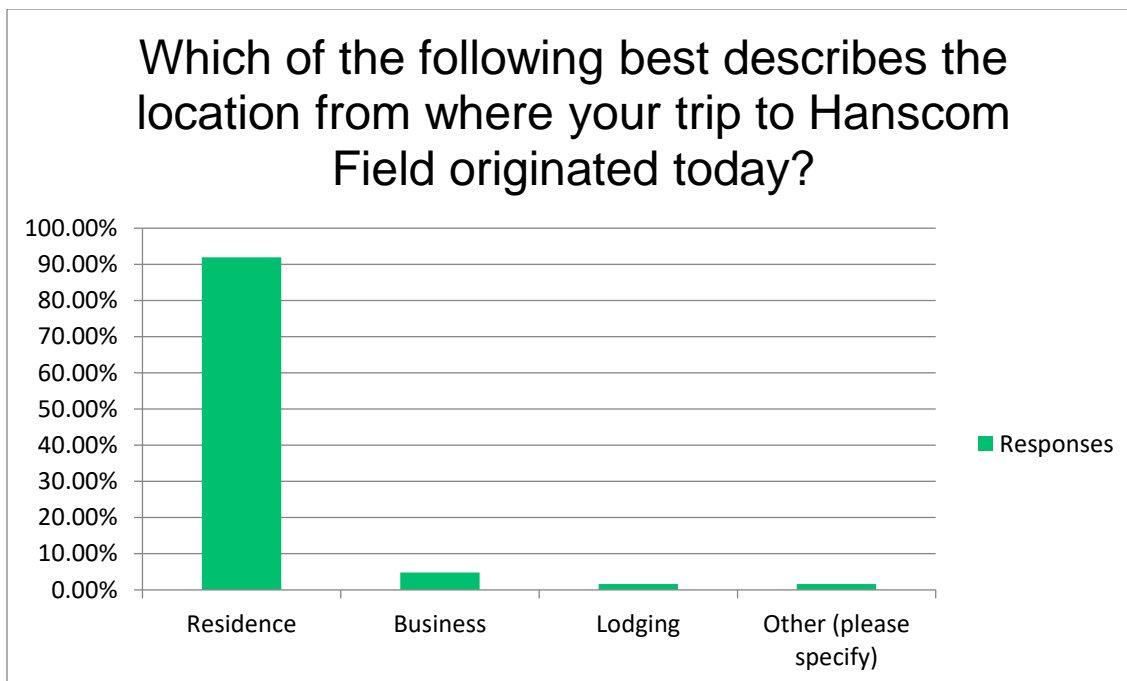
City	State	Zip	City	State	Zip
Abington	MA	02352	Lowell	MA	01850
Acton	MA	01720	Ludlow	MA	01056
Amherst	NH	03031	Lynnfield	MA	01940
Atkinson	NH	03811	Marblehead	MA	01945
Bedford	MA	01730	Maynard	MA	01754
Bedford	MA	01773	Medford	MA	02155
Boston	MA	02113	Melrose	MA	02176
Braintree	MA	02184	Merrimack	NH	03054
Brookline	NH	03033	Middleboro	MA	02346
Cambridge	MA	02138	Newmarket	NH	03857
Cambridge	MA	02138	Newton	MA	02466
Concord	MA	01742	Newton	MA	02459
Coventry	RI	02816	Northborough	MA	01532
Danvers	MA	01923	Pembroke	NH	03275
Derry	NH	03038	Plymouth	MA	02360
Derry	NH	03038	Reading	MA	01867
Dover	MA	02030	Revere	MA	02151
Essex	MA	01929	Sandwich	MA	02644
Exeter	RI	28224	Sarasota	FL	34232
Farmington	NH	03835	Sharon	MA	02067
Haverhill	MA		Somerville	MA	02143
Hollis	NH	03049	Tyngsborough	MA	01879
Ithaca	NY	14850	Waltham	MA	02451
Lexington	MA	02421	Watertown	MA	02472
Lexington	MA	02421	Wellesley	MA	02482
Lexington	MA	02420	Westminster	MA	01473
Lincoln	MA	01773	Westminster	MA	01473
Lincoln	MA	01773	Westwood	MA	02090
Lincoln	MA	01773	Winchester	MA	01890
Lincoln	MA	01773	Winthrop	MA	02152
Littleton	MA	01460			

2. Which of the following best describes the location from where your trip to Hanscom Field originated today?

Answer Choices	Responses	
Residence	91.94%	57
Business	4.84%	3
Lodging	1.61%	1
Other (please specify)	1.61%	1
Answered		62
Skipped		0

Other Responses:

Business and residence

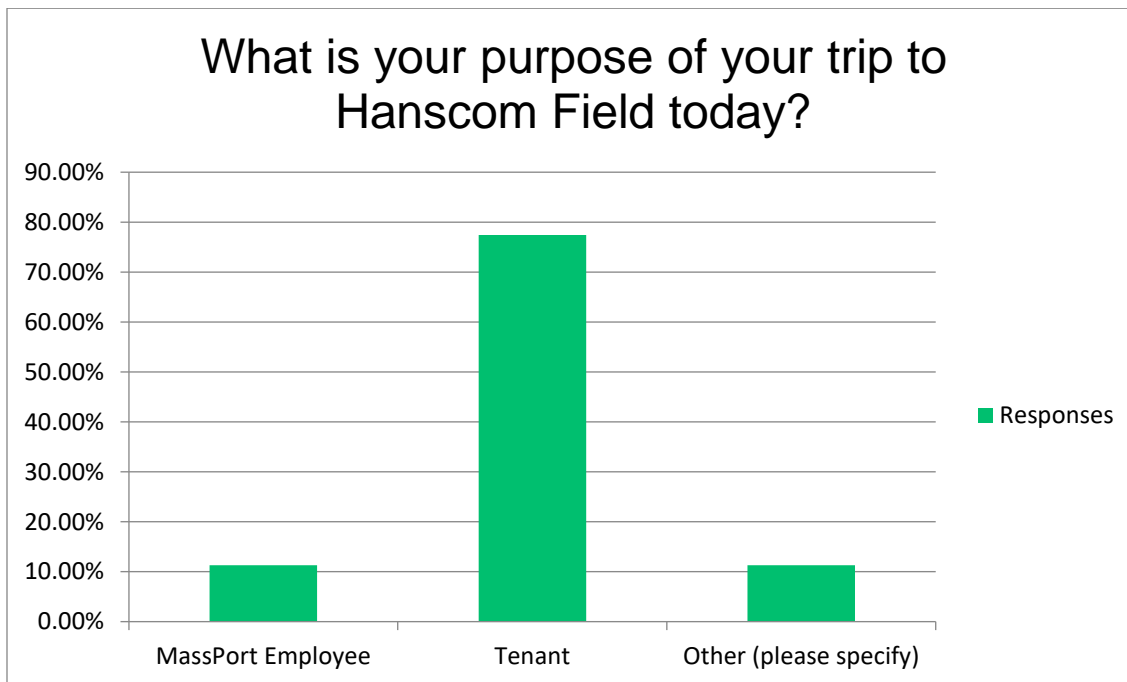


3. What is your purpose of your trip to Hanscom Field today?

Answer Choices	Responses	
MassPort Employee	11.29%	7
Tenant	77.42%	48
Other (please specify)	11.29%	7
Answered		62
Skipped		0

Other Responses:

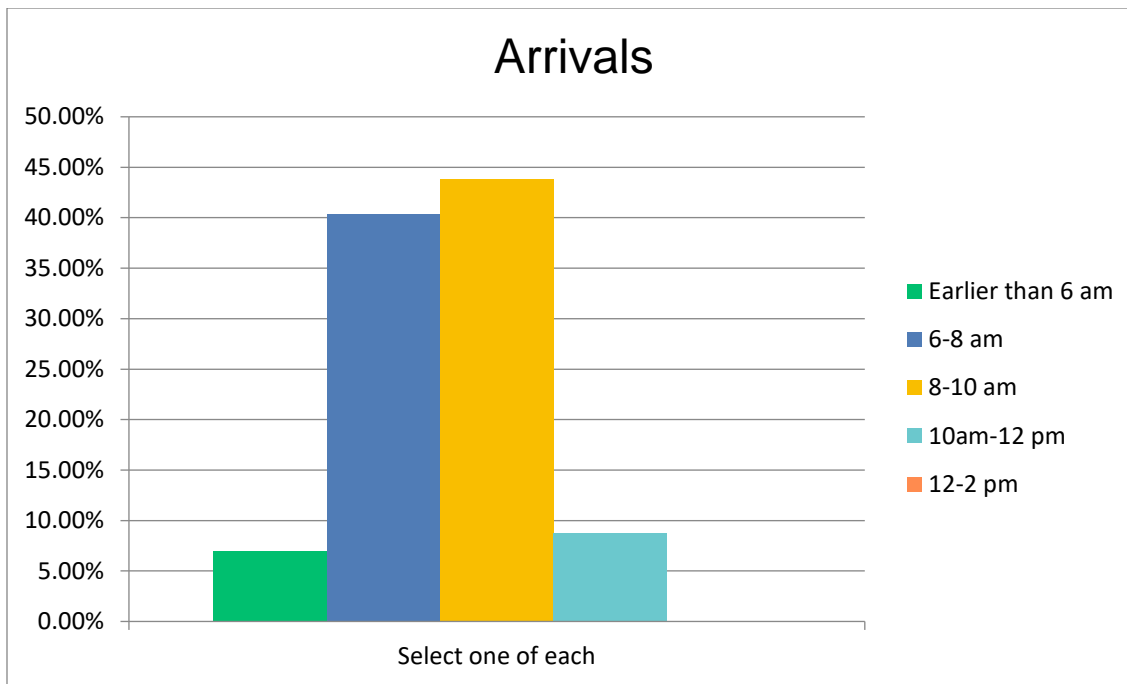
Airport business employee
ECAC Employee
FAA FMP Boston Manager
MIT Lincoln Laboratory Employee
SATCS
Signature Flight Support Employee
T hangar tenant



4. What time do you typically arrive and depart at Hanscom Field on weekdays?

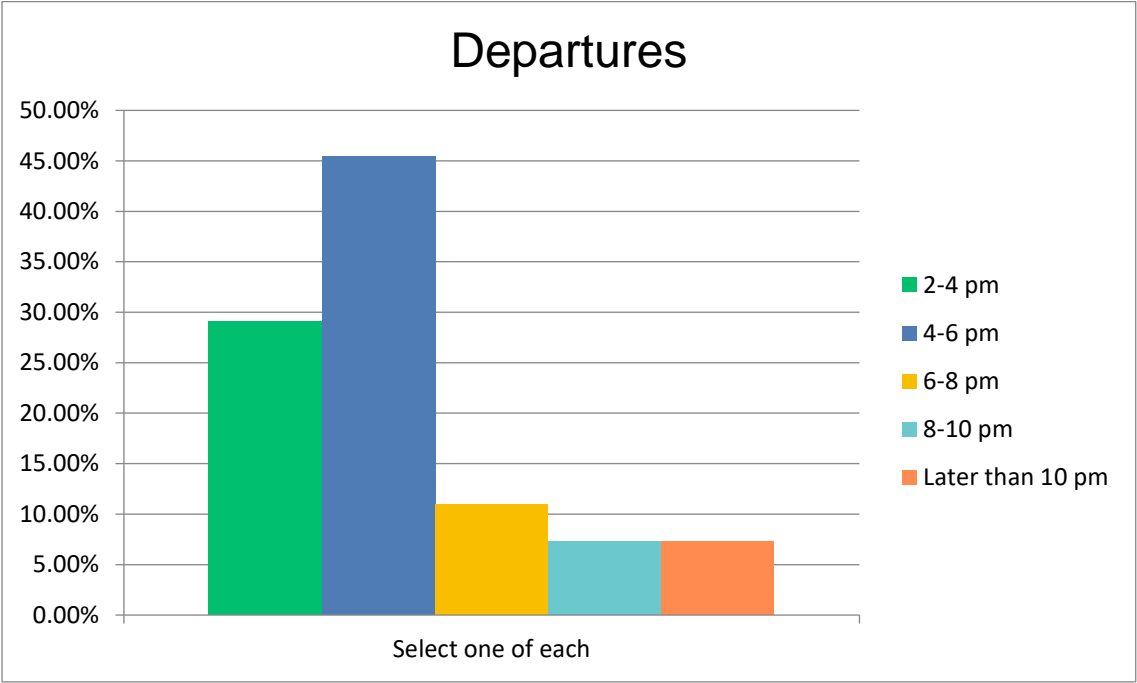
Arrivals

	Earlier than 6 am	6-8 am	8-10 am	10am-12 pm	12-2 pm	Total
Select one of each	7.02% 4	40.35% 23	43.86% 25	8.77% 5	0.00% 0	57
	Answered					57
	Skipped					5



Departures

	2-4 pm		4-6 pm		6-8 pm		8-10 pm		Later than 10 pm		Total
Select one of each	29.09%	16	45.45%	25	10.91%	6	7.27%	4	7.27%	4	55
Answered											57
Skipped											5



5. How do you commute to work at Hanscom Field on most days?

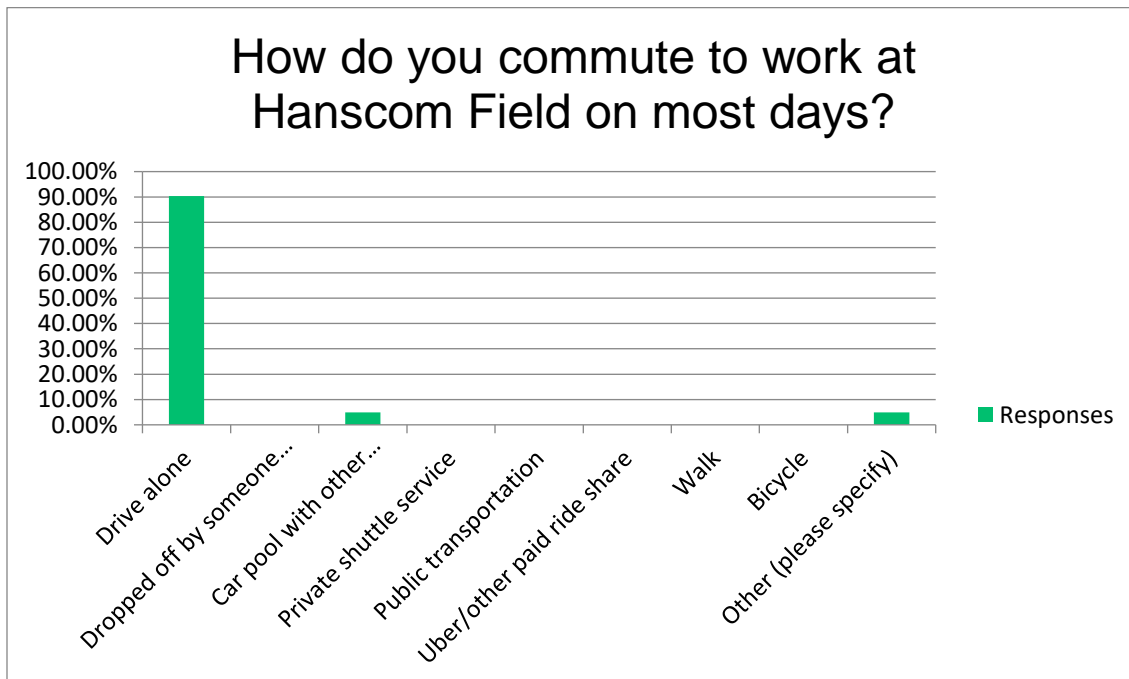
Answer Choices	Responses	
Drive alone	90.32%	56
Dropped off by someone who does not work at Hanscom Field	0.00%	0
Car pool with other Hanscom employees	4.84%	3
Private shuttle service	0.00%	0
Public transportation	0.00%	0
Uber/other paid ride share	0.00%	0
Walk	0.00%	0
Bicycle	0.00%	0
Other (please specify)	4.84%	3
Answered		62
Skipped		0

Other Responses:

Car pool with my significant other

Do not commute. Am a Pine Hill tenant.

I am a private pilot and come to the field about once a week



6. If using public transportation, which of the following do you use as your primary transit service??

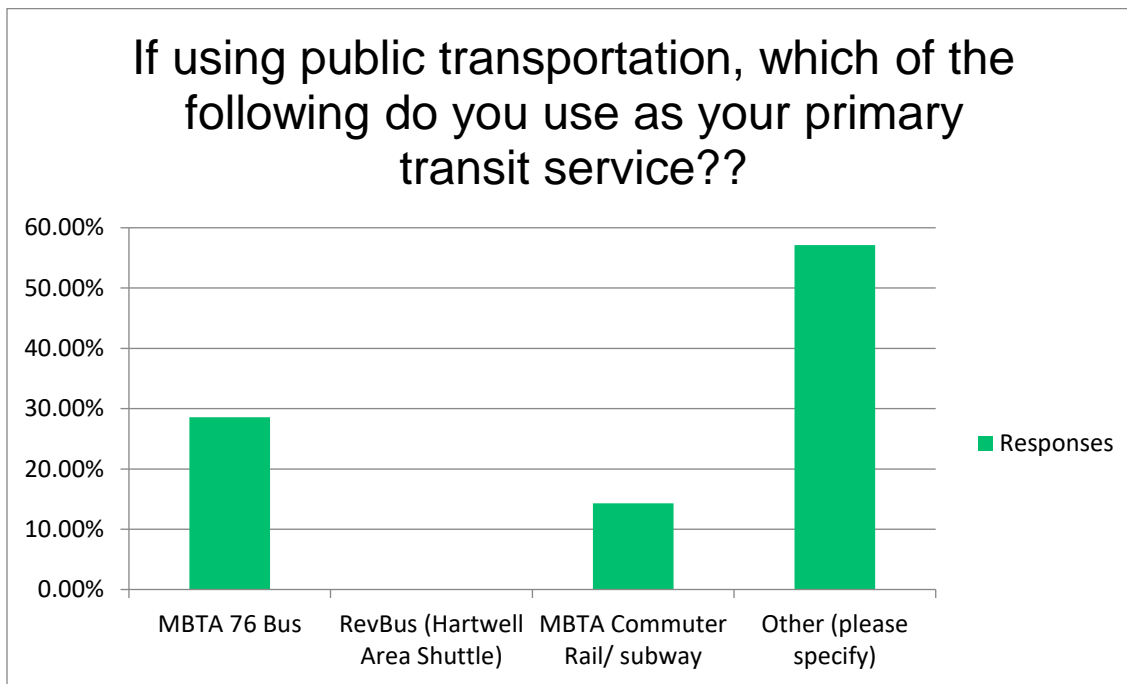
Answer Choices	Responses	
MBTA 76 Bus	28.57%	2
RevBus (Hartwell Area Shuttle)	0.00%	0
MBTA Commuter Rail/ subway	14.29%	1
Other (please specify)	57.14%	4
Answered		7
Skipped		55

Other Responses:

I wouldn't take public transportation, it would take hours

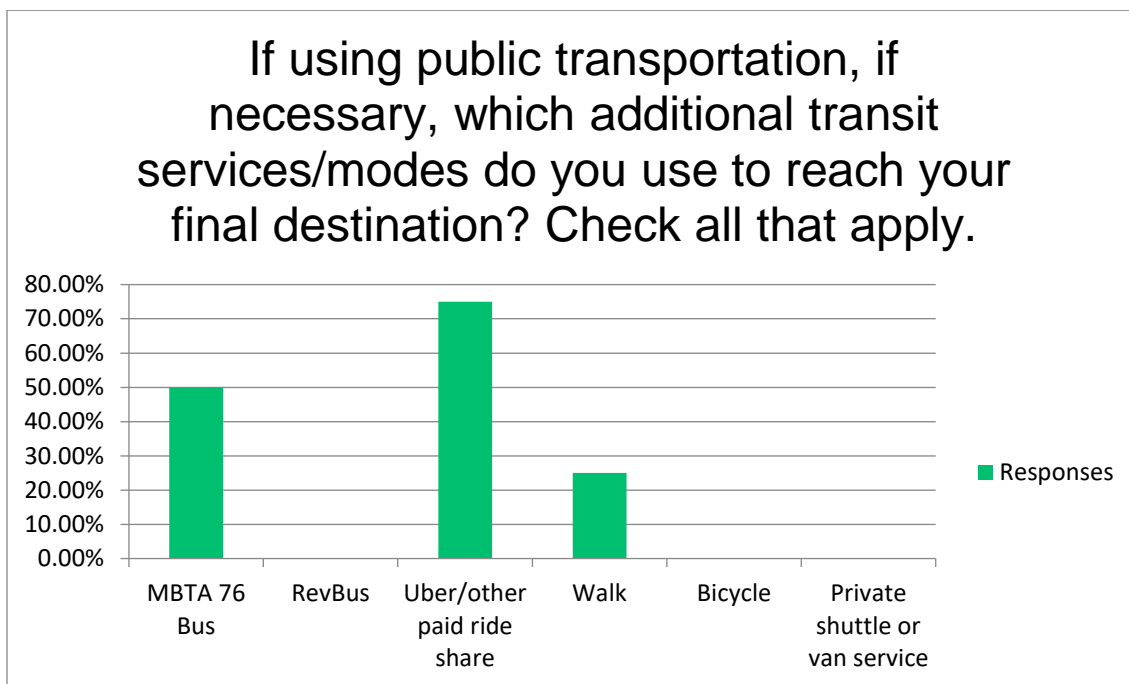
N/A

N/A no public transportation



7. If using public transportation, if necessary, which additional transit services/modes do you use to reach your final destination? Check all that apply.

Answer Choices	Responses	
MBTA 76 Bus	50.00%	2
RevBus	0.00%	0
Uber/other paid ride share	75.00%	3
Walk	25.00%	1
Bicycle	0.00%	0
Private shuttle or van service	0.00%	0
Answered		4
Skipped		58



8. What prevents you from using public transportation services? (check all that apply)

Answer Choices	Responses	
No pick-up/drop-off location near home	51.67%	31
No pick-up/drop-off location near work	6.67%	4
Service schedule does not work for me	28.33%	17
Personal safety	1.67%	1
The cost savings is not enough	15.00%	9
No direct route from home; requires transfer	40.00%	24
Lack of convenient/frequent shuttle/van service from transit stations to Hanscom	21.67%	13
Other (please specify)	20.00%	12
Answered		60
Skipped		2

Other Responses:

Aircraft equipment is too cumbersome

convenience and comfort

Feels unnecessary/I need a car for daytime travel

I commute from various places and need my car

I could take the red line to Alewife and the bus from there, but it would take at least twice as long compared to driving. If the airport provided a shuttle to/from a local commuter rail station (even if it wasn't free), I would be more apt to take the commuter rail.

I drive myself... live 10 min away

I'm a pilot & work odd hours with no set schedule

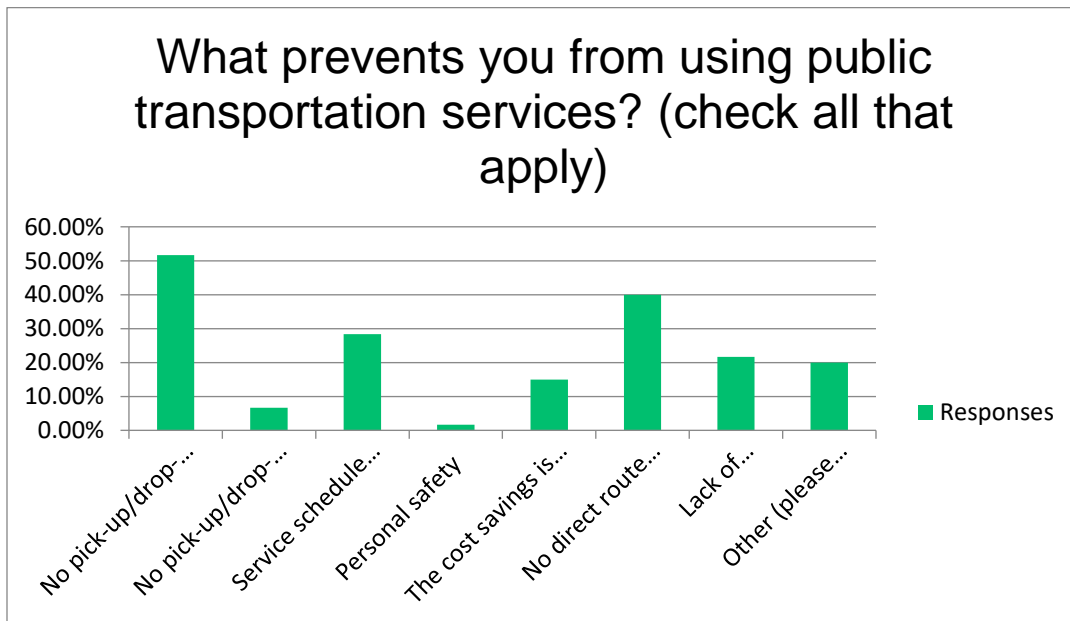
N/A

need company vehicle

need to access ATCT with vehicle

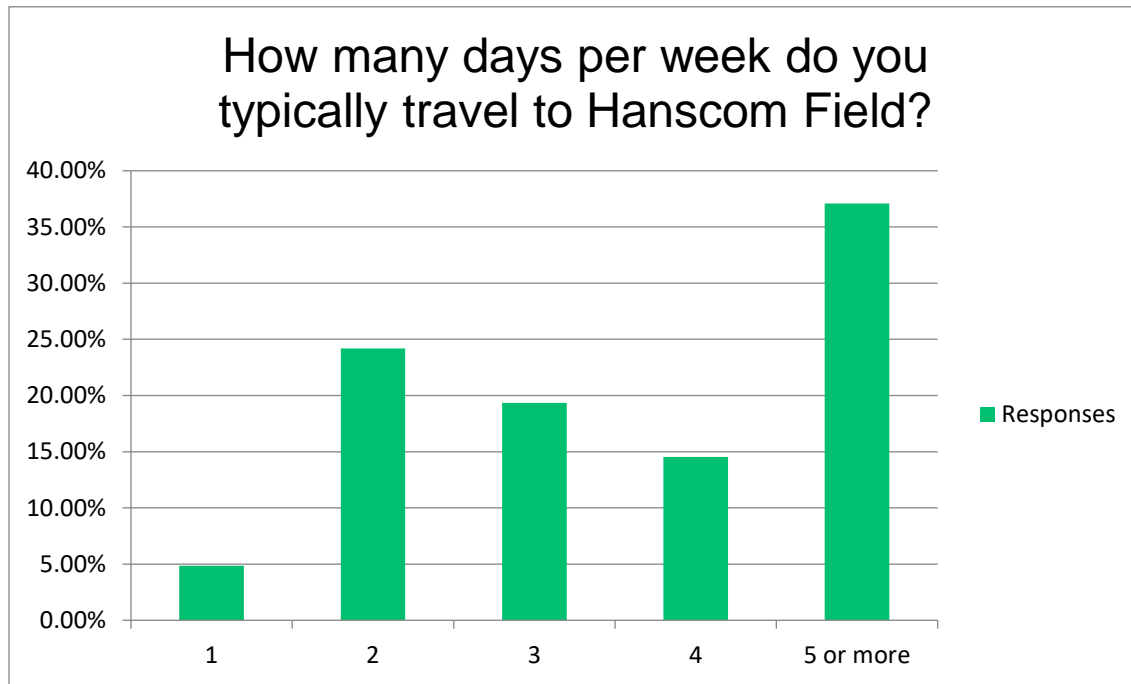
Need to be flexible. Work schedule changes make it inconvenient.

There is no public transportation from NH



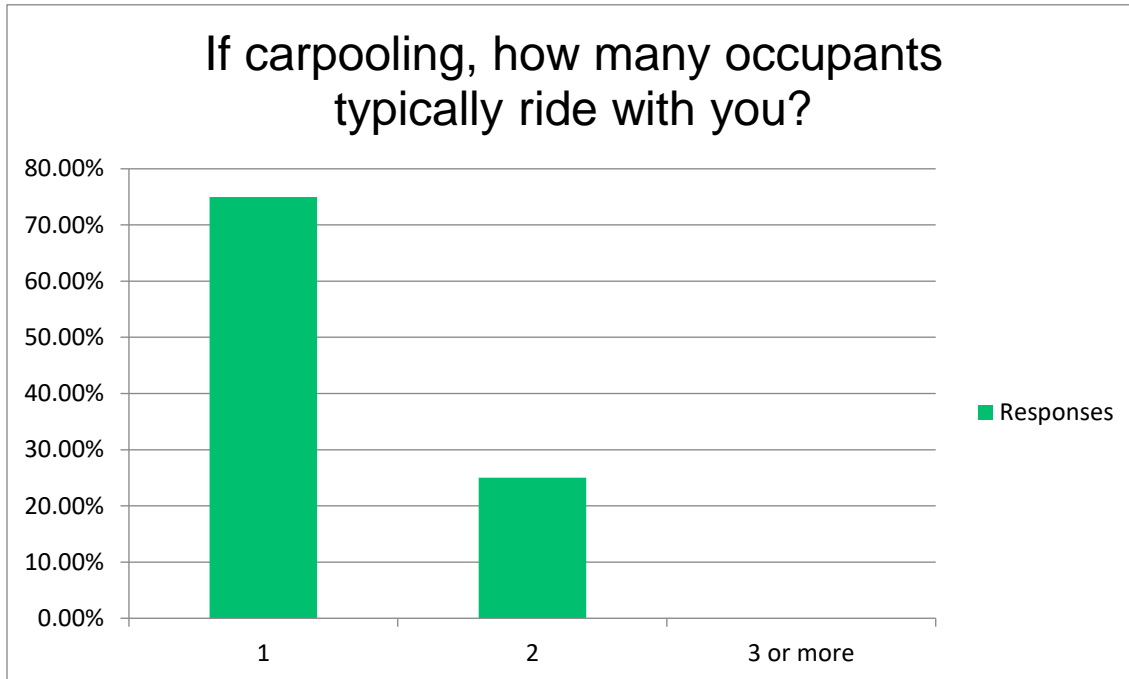
9. How many days per week do you typically travel to Hanscom Field?

Answer Choices	Responses	
1	4.84%	3
2	24.19%	15
3	19.35%	12
4	14.52%	9
5 or more	37.10%	23
Answered		62
Skipped		0



10. If carpooling, how many occupants typically ride with you?

Answer Choices	Responses	
1	75.00%	6
2	25.00%	2
3 or more	0.00%	0
Answered		8
Skipped		54

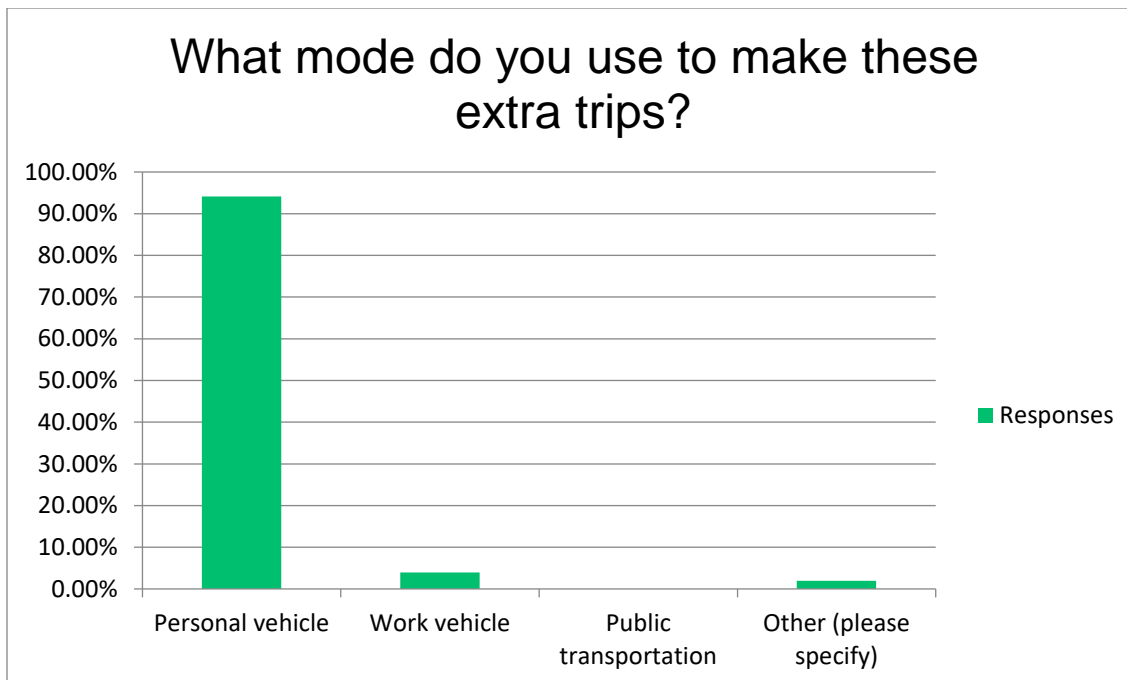


11. What mode do you use to make these extra trips?

Answer Choices	Responses	
Personal vehicle	94.12%	48
Work vehicle	3.92%	2
Public transportation	0.00%	0
Other (please specify)	1.96%	1
Answered		51
Skipped		11

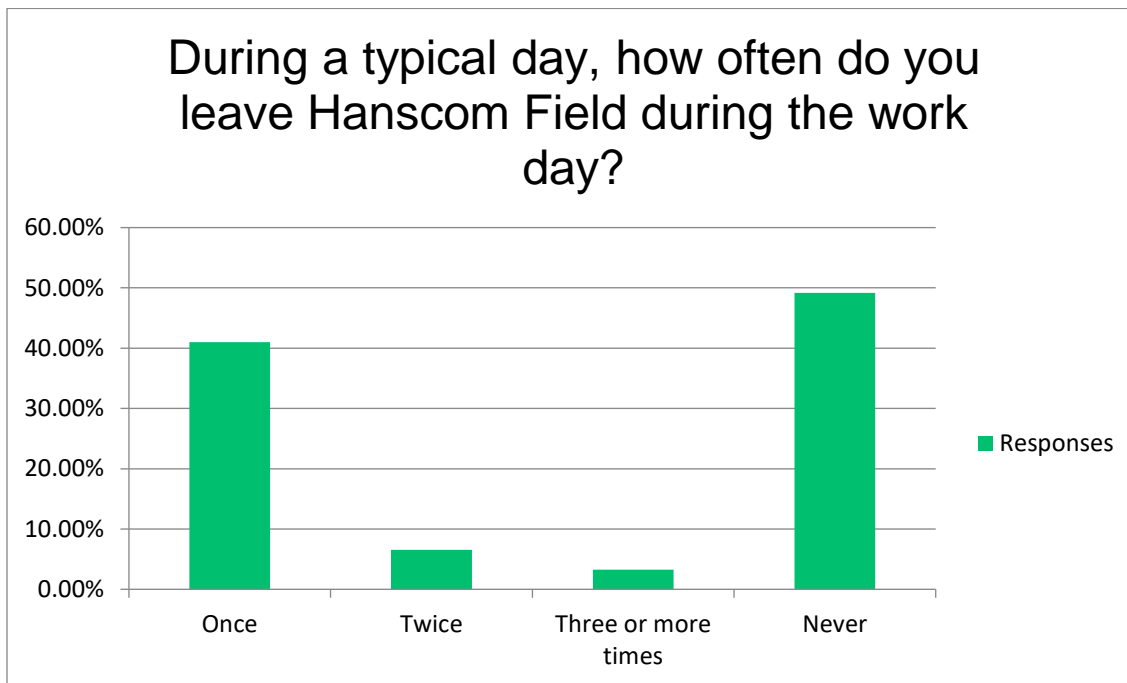
Other Responses:

Personal vehicle but they are not other trips, I car pool with my significant other



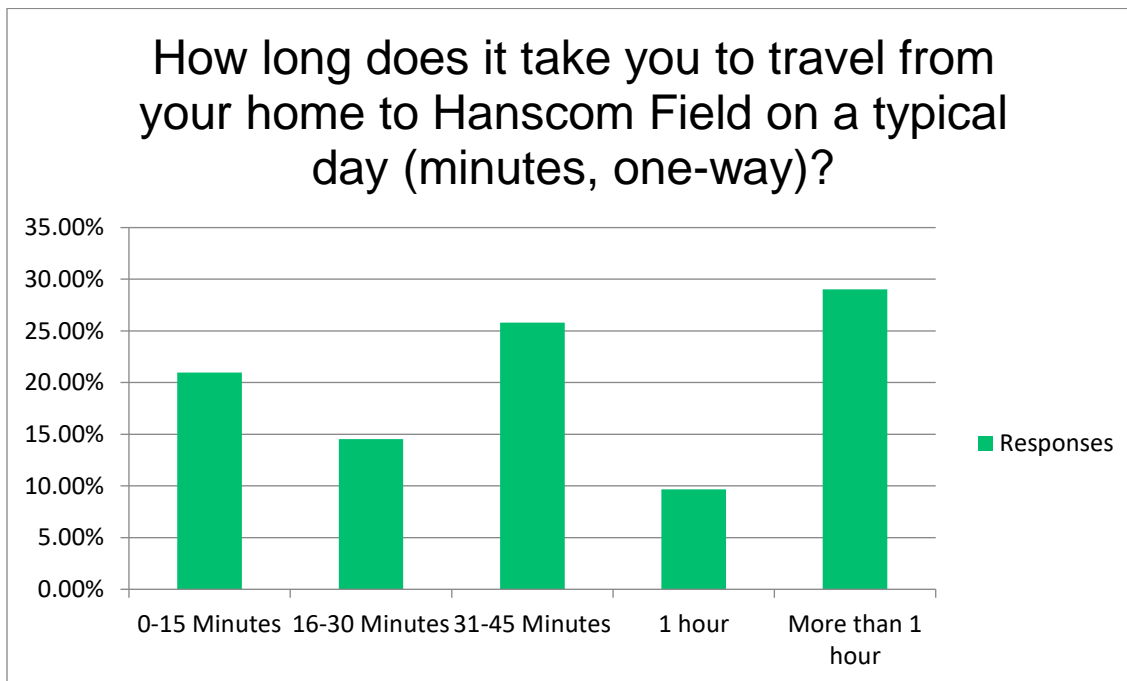
12. During a typical day, how often do you leave Hanscom Field during the work day?

Answer Choices	Responses	
Once	40.98%	25
Twice	6.56%	4
Three or more times	3.28%	2
Never	49.18%	30
Answered		61
Skipped		1



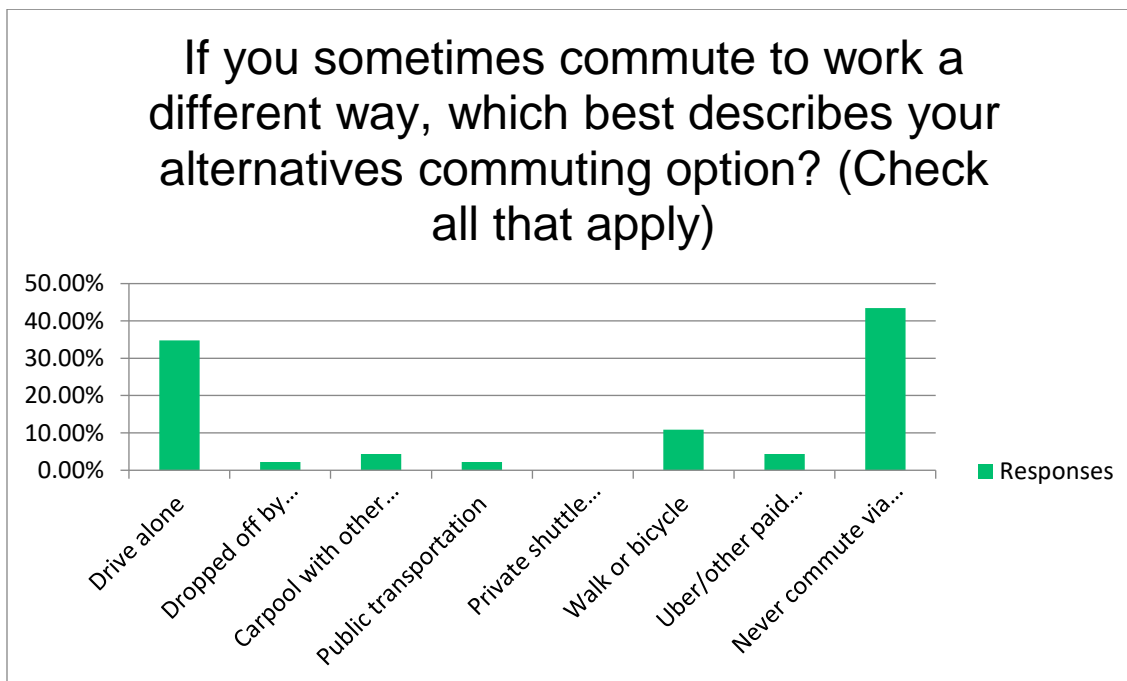
13. How long does it take you to travel from your home to Hanscom Field on a typical day (minutes, one-way)?

Answer Choices	Responses	
0-15 Minutes	20.97%	13
16-30 Minutes	14.52%	9
31-45 Minutes	25.81%	16
1 hour	9.68%	6
More than 1 hour	29.03%	18
Answered		62
Skipped		0



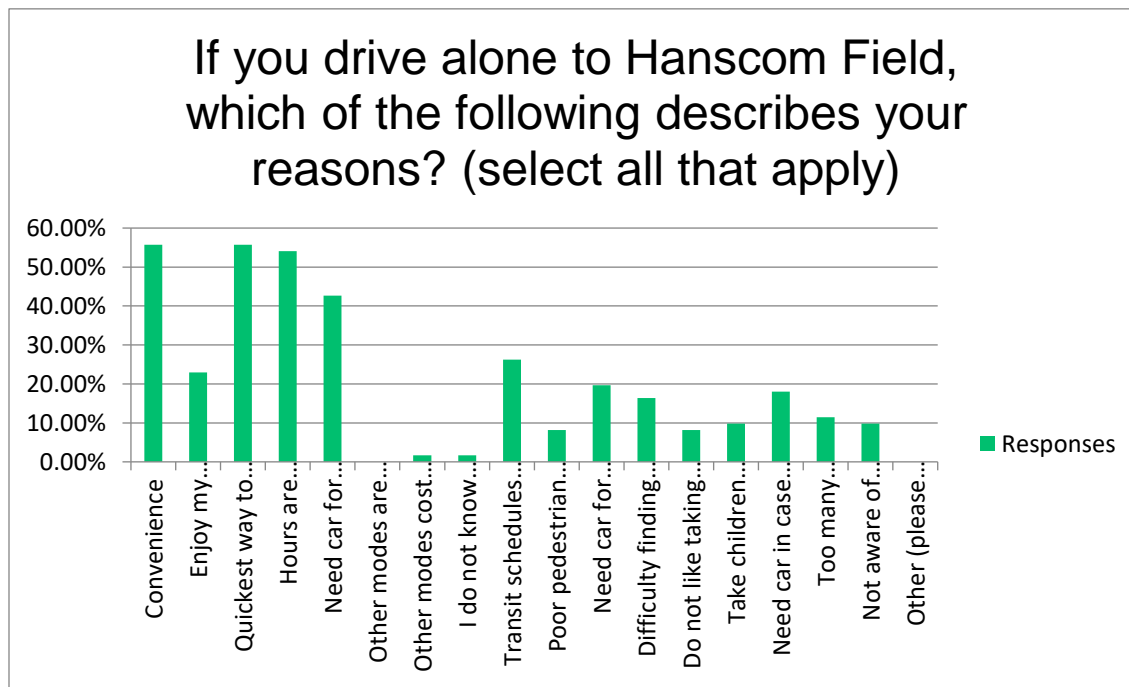
14. If you sometimes commute to work a different way, which best describes your alternatives commuting option? (Check all that apply)

Answer Choices	Responses	
Drive alone	34.78%	16
Dropped off by someone who does not work at Hanscom	2.17%	1
Carpool with other Hanscom employees	4.35%	2
Public transportation	2.17%	1
Private shuttle service	0.00%	0
Walk or bicycle	10.87%	5
Uber/other paid ride share	4.35%	2
Never commute via different mode	43.48%	20
Answered		46
Skipped		16



15. If you drive alone to Hanscom Field, which of the following describes your reasons? (select all that apply)

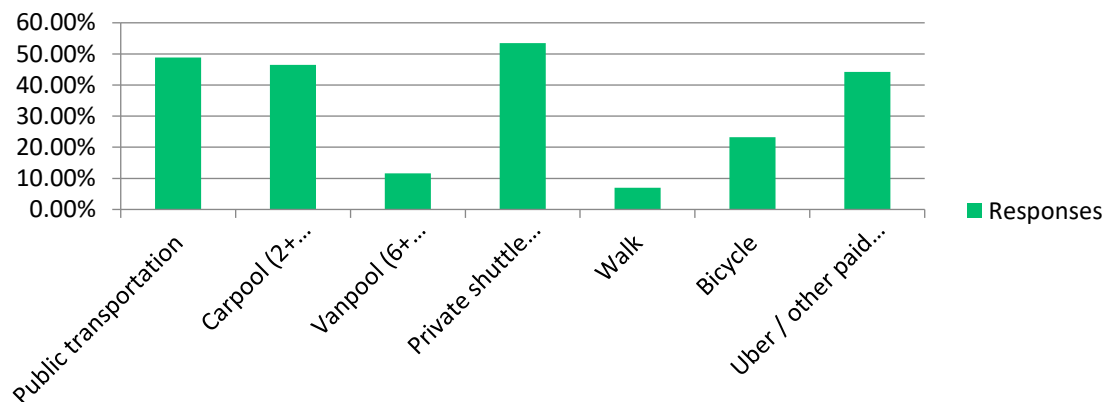
Answer Choices	Responses	
Convenience	55.74%	34
Enjoy my privacy/prefer to drive alone	22.95%	14
Quickest way to work	55.74%	34
Hours are irregular and vary daily	54.10%	33
Need car for errands before/after work	42.62%	26
Other modes are not safe	0.00%	0
Other modes cost too much	1.64%	1
I do not know how to use public transportation	1.64%	1
Transit schedules and routes are not convenient/frequent enough to meet my schedule	26.23%	16
Poor pedestrian access to transit and/or work	8.20%	5
Need car for work-related trips	19.67%	12
Difficulty finding others to carpool with	16.39%	10
Do not like taking the bus	8.20%	5
Take children to/from daycare	9.84%	6
Need car in case of emergencies	18.03%	11
Too many transfers on public transportation	11.48%	7
Not aware of other options	9.84%	6
Other (please specify)	0.00%	0
Answered		61
Skipped		1



16. Please select the THREE alternative modes of transportation you would consider using to travel to Hanscom Field.

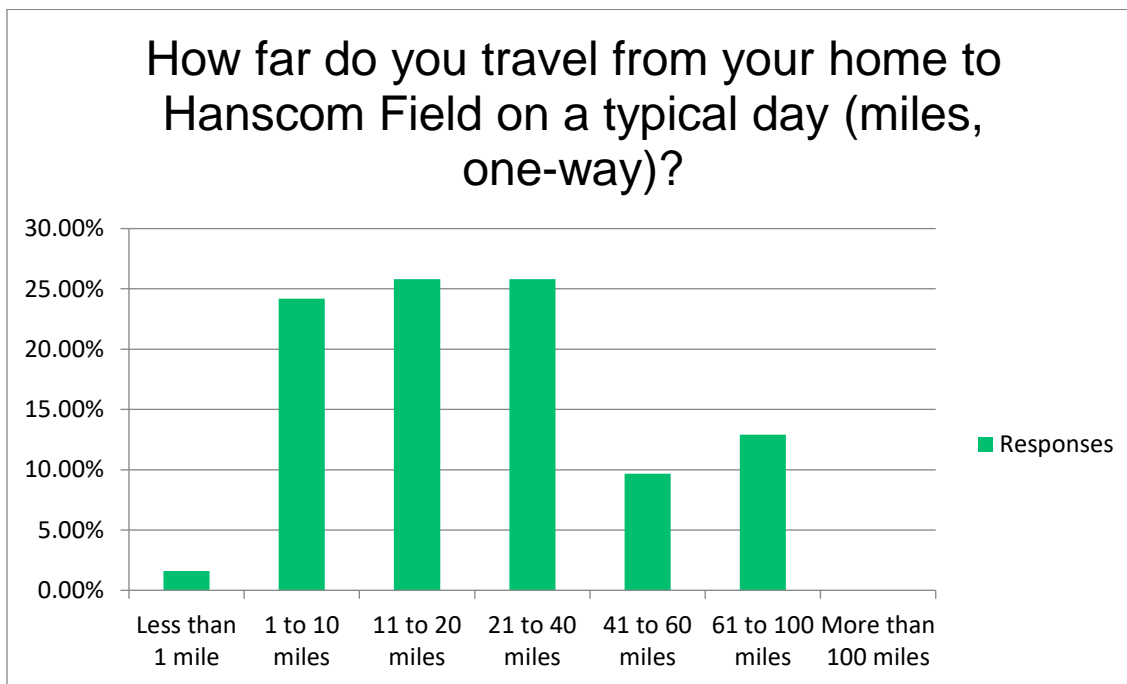
Answer Choices	Responses	
Public transportation	48.84%	21
Carpool (2+ passengers)	46.51%	20
Vanpool (6+ passengers)	11.63%	5
Private shuttle service	53.49%	23
Walk	6.98%	3
Bicycle	23.26%	10
Uber / other paid ride share	44.19%	19
Answered		43
Skipped		19

Please select the THREE alternative modes of transportation you would consider using to travel to Hanscom Field.



17. How far do you travel from your home to Hanscom Field on a typical day (miles, one-way)?

Answer Choices	Responses	
Less than 1 mile	1.61%	1
1 to 10 miles	24.19%	15
11 to 20 miles	25.81%	16
21 to 40 miles	25.81%	16
41 to 60 miles	9.68%	6
61 to 100 miles	12.90%	8
More than 100 miles	0.00%	0
Answered		62
Skipped		0



18. Would any of the following incentives or services motivate you to change to carpooling for part or all of the week?

Answer Choices	Responses	
Free guaranteed ride home	26.47%	9
Preferential parking for carpools/vanpools	0.00%	0
Help with finding someone to carpool/vanpool with	11.76%	4
Company car available if necessary	11.76%	4
Bicycle Storage	5.88%	2
Financial incentive/subsidy for transit/carpool/vanpool costs	20.59%	7
Shuttle bus from park and ride	5.88%	2
Other (please specify)	17.65%	6
Answered		34
Skipped		28

Other Responses:

Charging station for PHEV

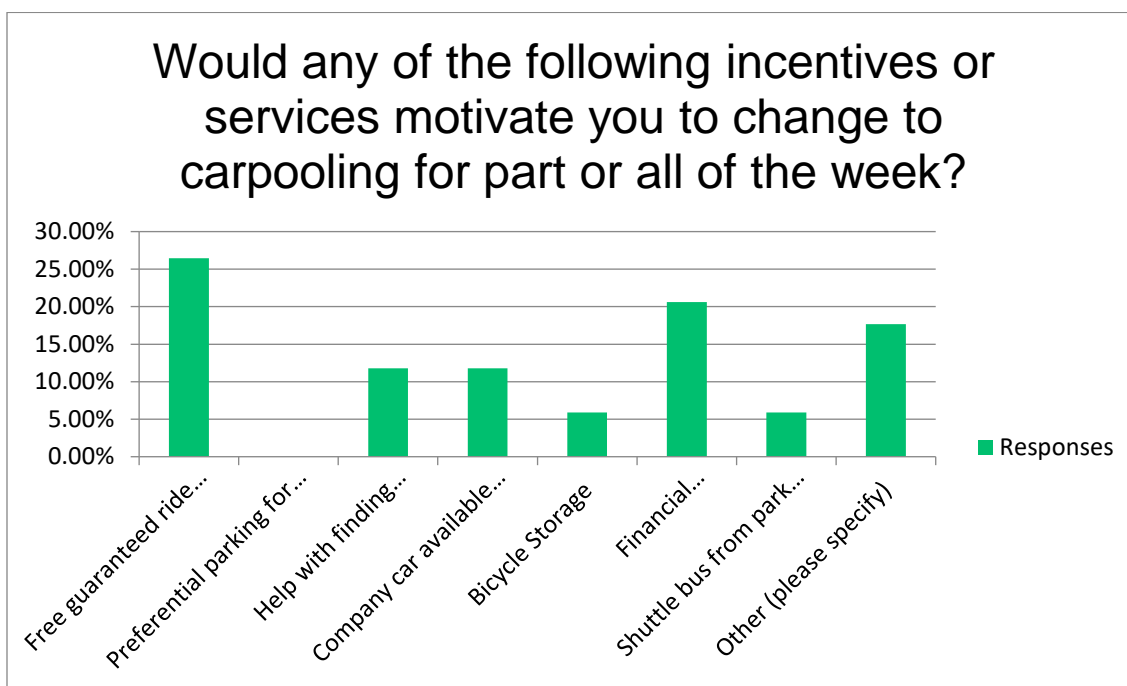
I would not change my driving habits.

no

None, travel alone.

Not relevant to me as a tenant at Pine Hill.

Train



19. If you currently drive alone, would you be willing to change to using public transit if the following incentives or services were in place? (select all that apply)

Answer Choices	Responses	
Financial subsidy/tax credits for public transportation (bus service) passes	30.30%	10
On-site information on transit routes and schedules	12.12%	4
Better/more convenient bus services, schedules, and routes	51.52%	17
Free guaranteed ride home	45.45%	15
Company car available if necessary	33.33%	11
Better/more frequent shuttle bus or van service from commuter rail/subway stations	33.33%	11
Other (please specify)	18.18%	6
Answered		33
Skipped		29

Other Responses:

An express shuttle to/from the airport and commuter rail station (like Lincoln) would be awesome!

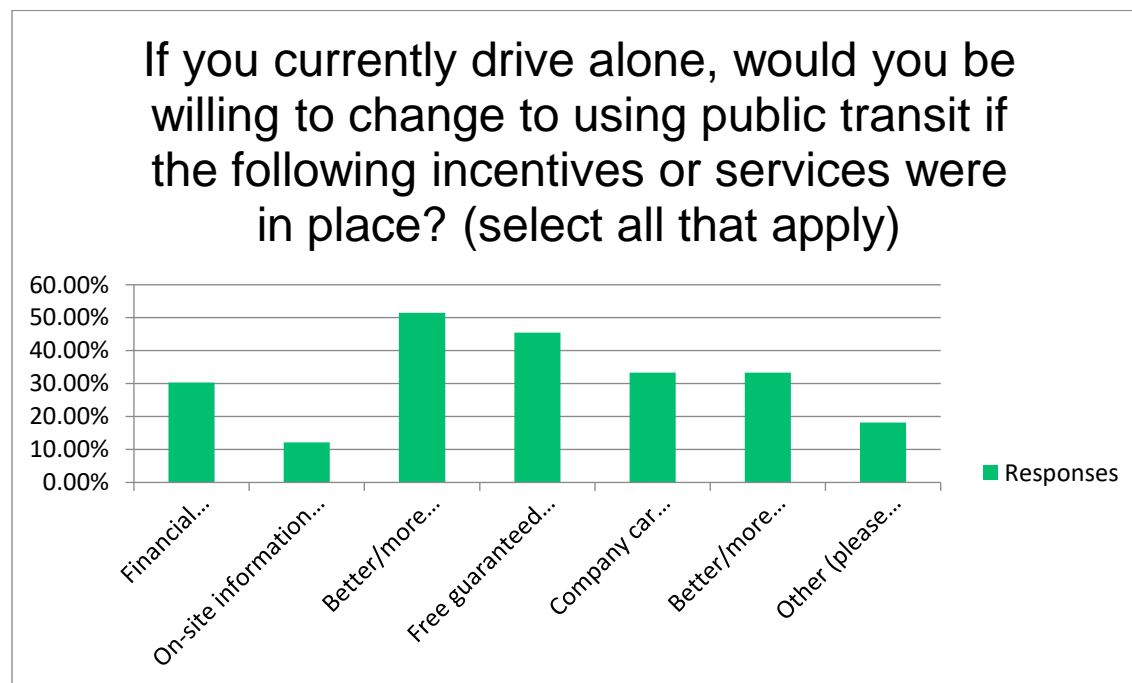
Have childcare restrictions that may prohibit

I prefer the convenience and flexibility of commuting on my own schedule.

N/A

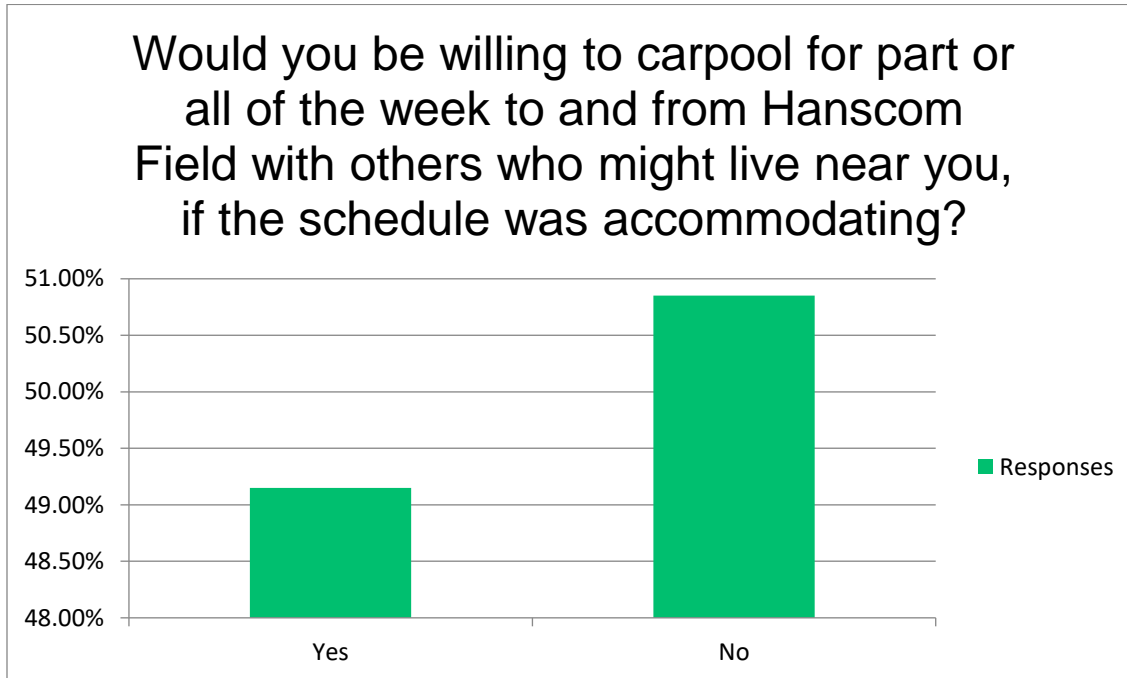
no

Not willing to use public transportation



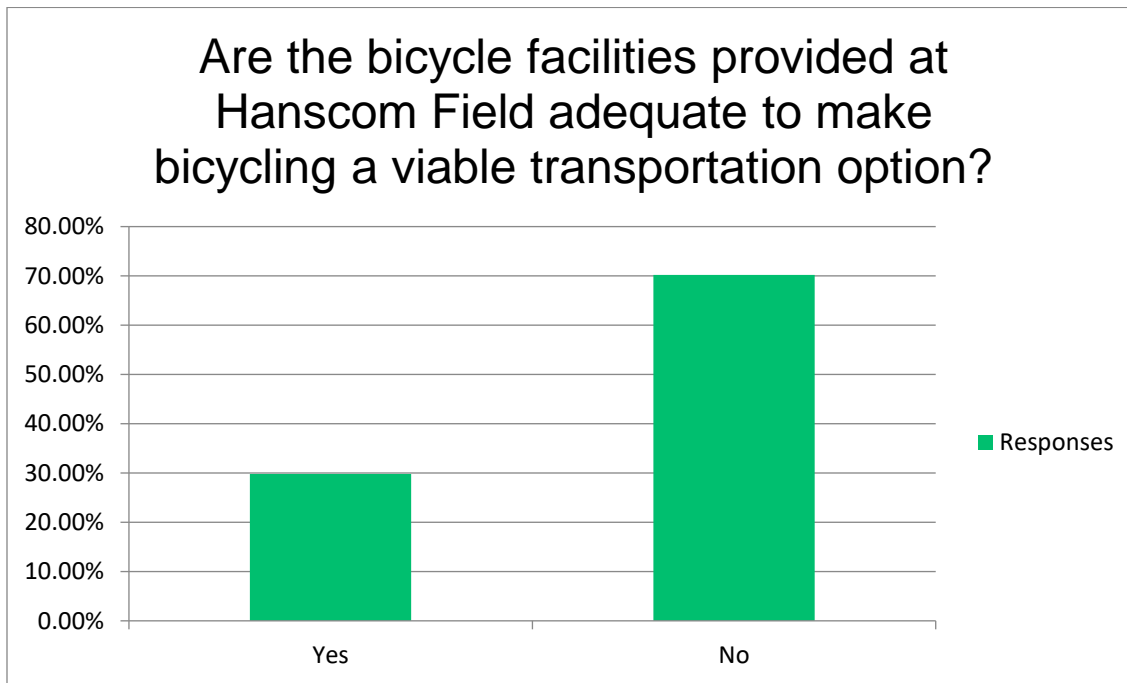
20. Would you be willing to carpool for part or all of the week to and from Hanscom Field with others who might live near you, if the schedule was accommodating?

Answer Choices	Responses	
Yes	49.15%	29
No	50.85%	30
Answered		59
Skipped		3



21. Are the bicycle facilities provided at Hanscom Field adequate to make bicycling a viable transportation option?

Answer Choices		Responses
Yes	29.79%	14
No	70.21%	33
Answered		47
Skipped		15

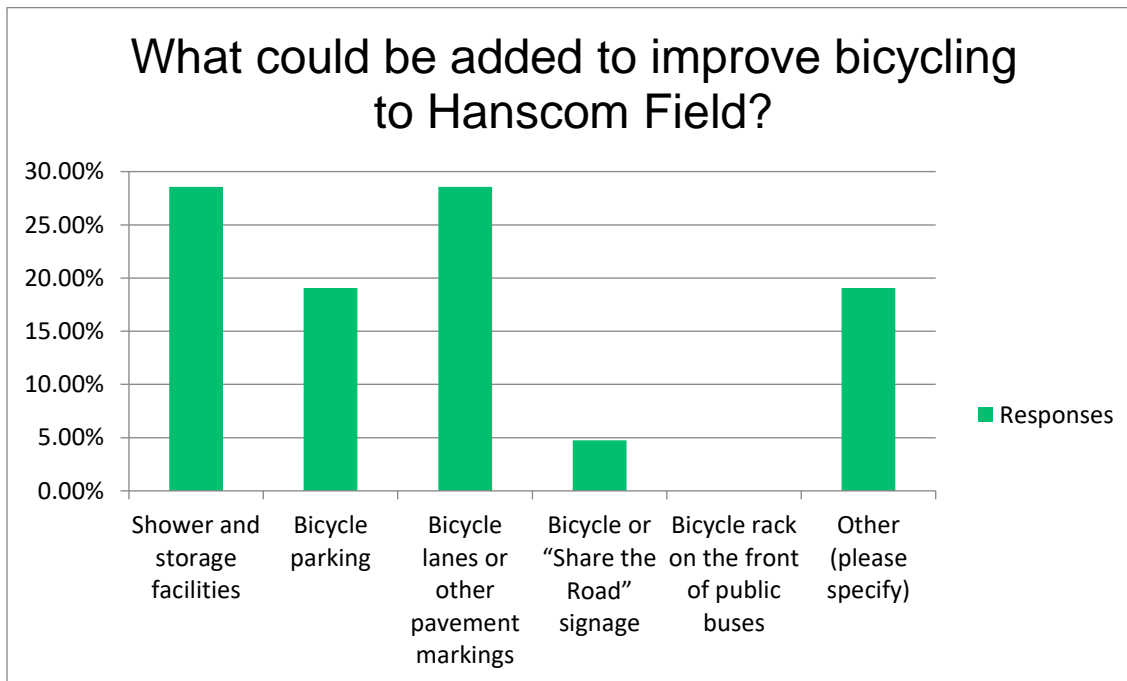


22. What could be added to improve bicycling to Hanscom Field?

Answer Choices	Responses	
Shower and storage facilities	28.57%	6
Bicycle parking	19.05%	4
Bicycle lanes or other pavement markings	28.57%	6
Bicycle or "Share the Road" signage	4.76%	1
Bicycle rack on the front of public buses	0.00%	0
Other (please specify)	19.05%	4
Answered		21
Skipped		41

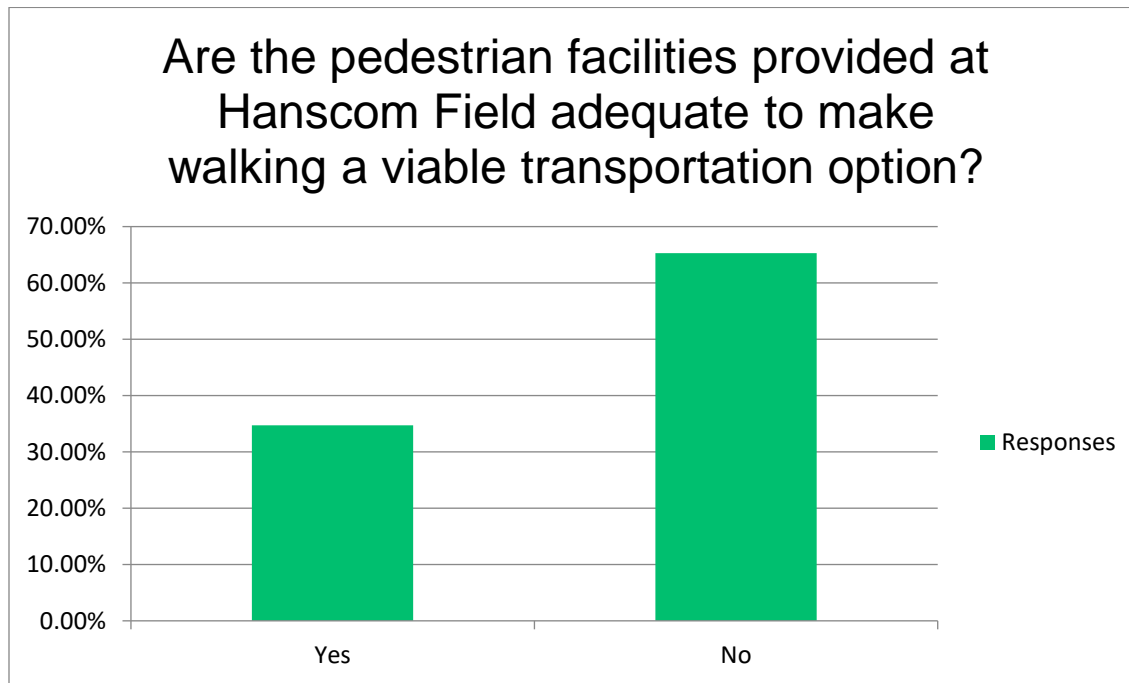
Other Responses:

covered parking so that electric bicycles don't get rained on
 I do not have a convenient/safe way to commute via bike to/from
 work.
 N/A
 No



23. Are the pedestrian facilities provided at Hanscom Field adequate to make walking a viable transportation option?

Answer Choices	Responses	
Yes	34.69%	17
No	65.31%	32
Answered		49
Skipped		13



24. What could be added to improve the pedestrian friendliness and walkability at Hanscom?

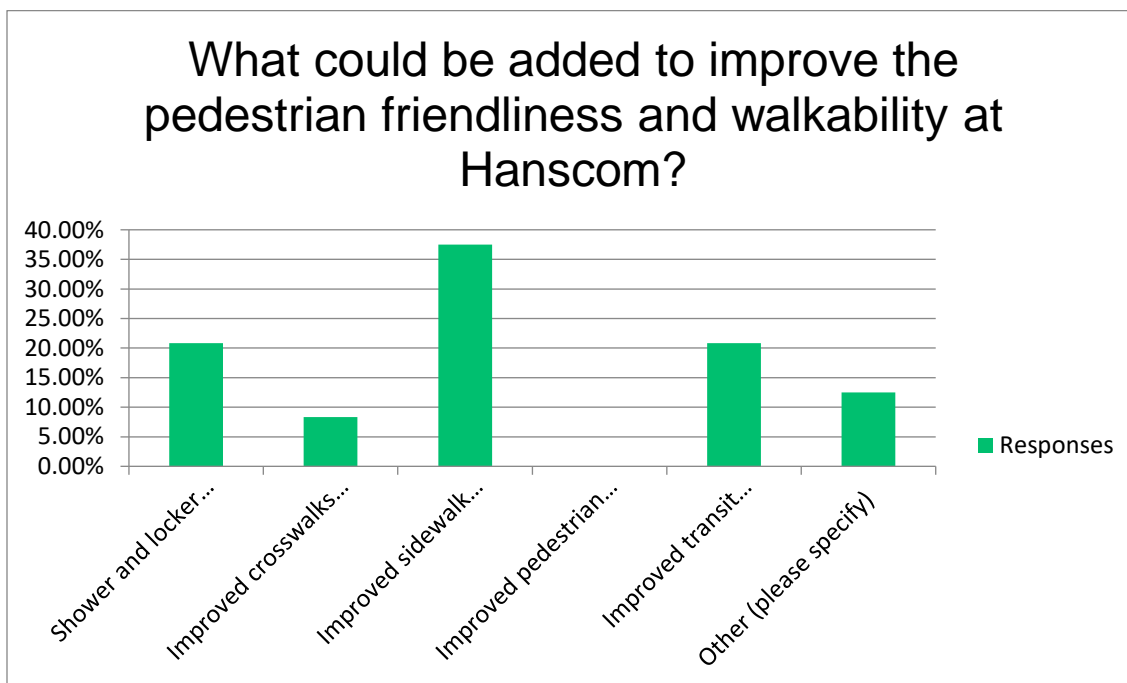
Answer Choices	Responses	
Shower and locker facilities	20.83%	5
Improved crosswalks (including lighted crossing signs)	8.33%	2
Improved sidewalk infrastructure/connections	37.50%	9
Improved pedestrian signs	0.00%	0
Improved transit connections with existing services	20.83%	5
Other (please specify)	12.50%	3
Answered		24
Skipped		38

Other Responses:

I do not walk to work.

I would need to move. I live 33 miles away

Too far to walk



25. Based on your responses related to bicycling and pedestrian facilities, please provide specific locations/intersections/roadways at Hanscom where improvements are needed to enhance walking and biking. Please be as specific as you can (e.g., Crosswalks and pedestrian signals are needed at the intersection of Bedford Road and Hanscom Drive).

Answered	16
Skipped	46

Other Responses:

crosswalks and pedestrian signals are needed at the intersection of Bedford Rd and Hanscom Dr.

Crosswalks at intersections entering Hanscom

Hanscom Drive

Hanscom Drive from Rt 2A (adequate for biking, but not walking)

I don't think walking is an option.

Intersection of Old Bedford Rd and Hanscom Drive

Need bike racks to lock up bikes

pedestrian and bike trail from MMNP along Hanscom Dr

Route 2A

Sidewalk along Virginia Rd...too many bike/pedestrians hit by cars (although I believe that is city owned)

Sidewalks

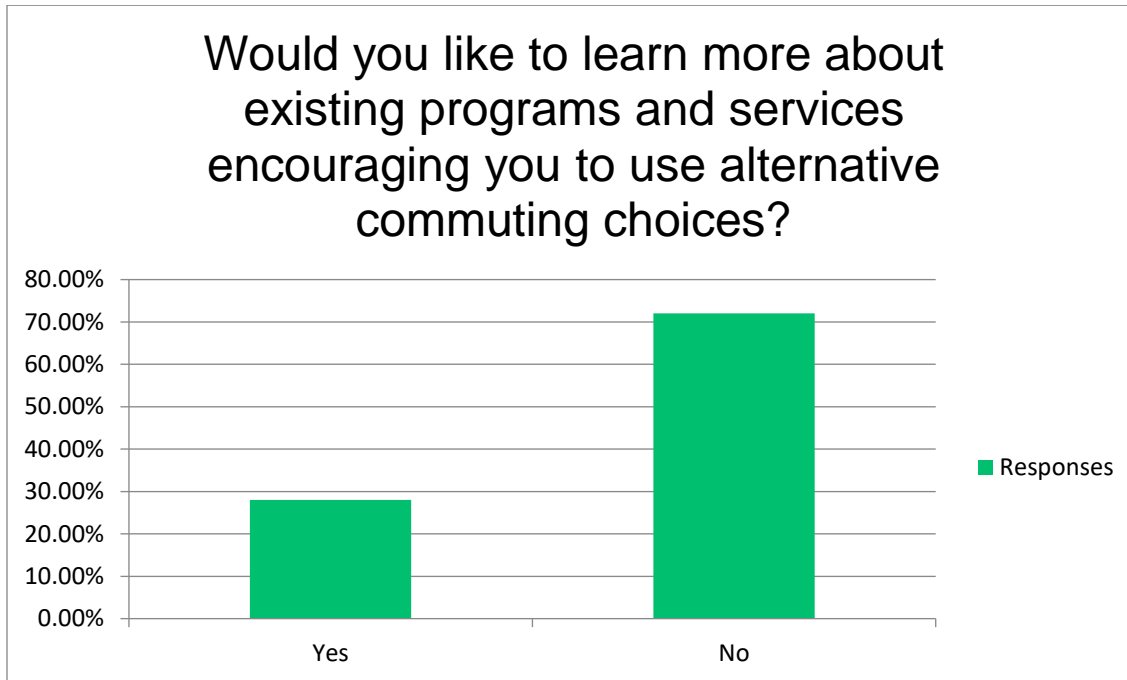
Virginia Road along the runway 5 threshold could be safer for pedestrians and bicyclists.

Virginia St & Hanscom Dr

Way too far to cycle or walk

26. Would you like to learn more about existing programs and services encouraging you to use alternative commuting choices?

Answer Choices	Responses	
Yes	28.00%	14
No	72.00%	36
Answered		50
Skipped		12



27. Do you have other thoughts or comments on transportation to/from Hanscom Field?

Answered

11

Skipped

51

Other Responses:

Aviation requires flexibility in one's schedule. Public transportation is not flexible.
commuter rail shuttle!

Due to my schedule, I can only drive by myself to work.

No

No

Not sure there is much that Hanscom can do as it's really the highway traffic getting to Hanscom that is tough. Would also be nice to have a full traffic light at the corner of Hanscom Dr and route 2a.

Please add charging stations for plug-in electric vehicles

Shuttle bus service from Lincoln or Concord Commuter Rail Station to airport

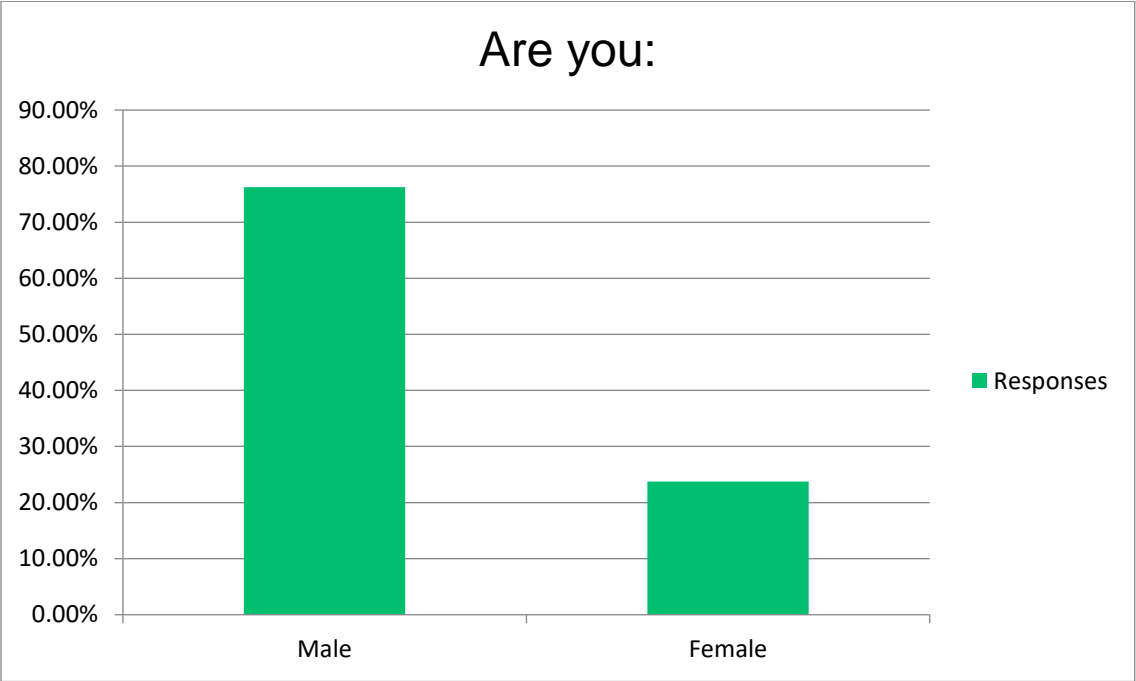
taking a left onto Bedford Rd from Hanscom Dr at rush hour is AWFUL. A traffic light would be most helpful.

We need a shuttle to Alewife every 15 minutes. That's how it works in Moscow on the commuter rule. Every 15 minutes all day every day. (the metro runs every 1 minute on weekdays, every 2 minutes on weekends)

Yes, please call. Tenant at Pine Hill and Jet Aviation.

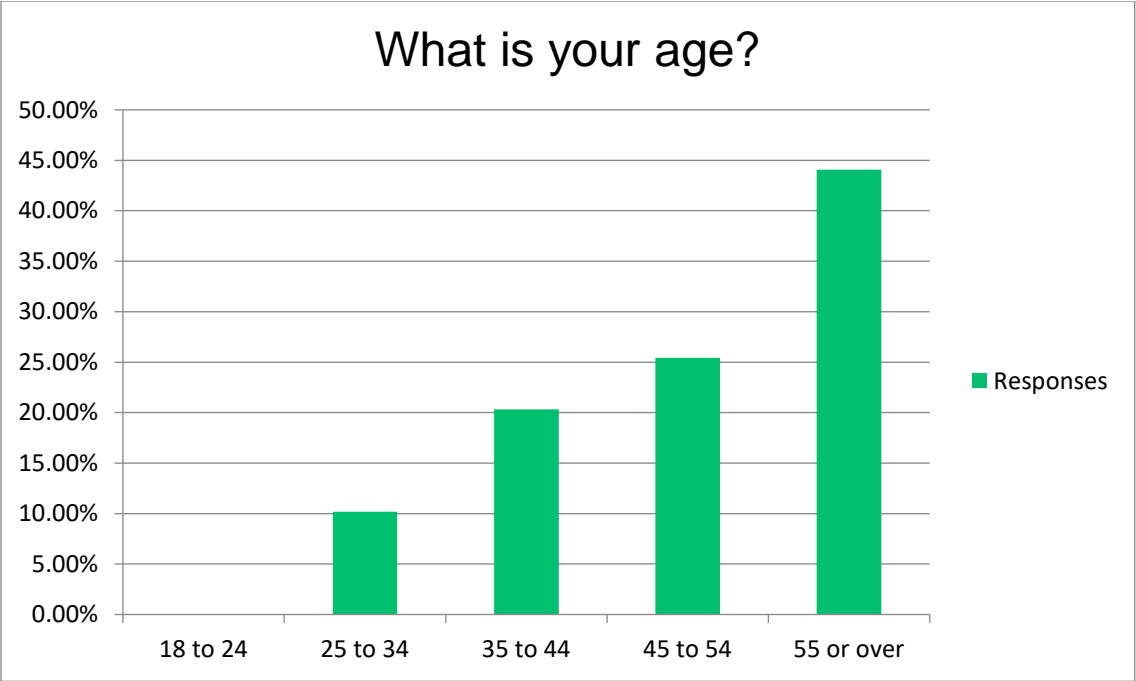
28. Are you:

Answer Choices	Responses	
Male	76.27%	45
Female	23.73%	14
Answered		59
Skipped		3



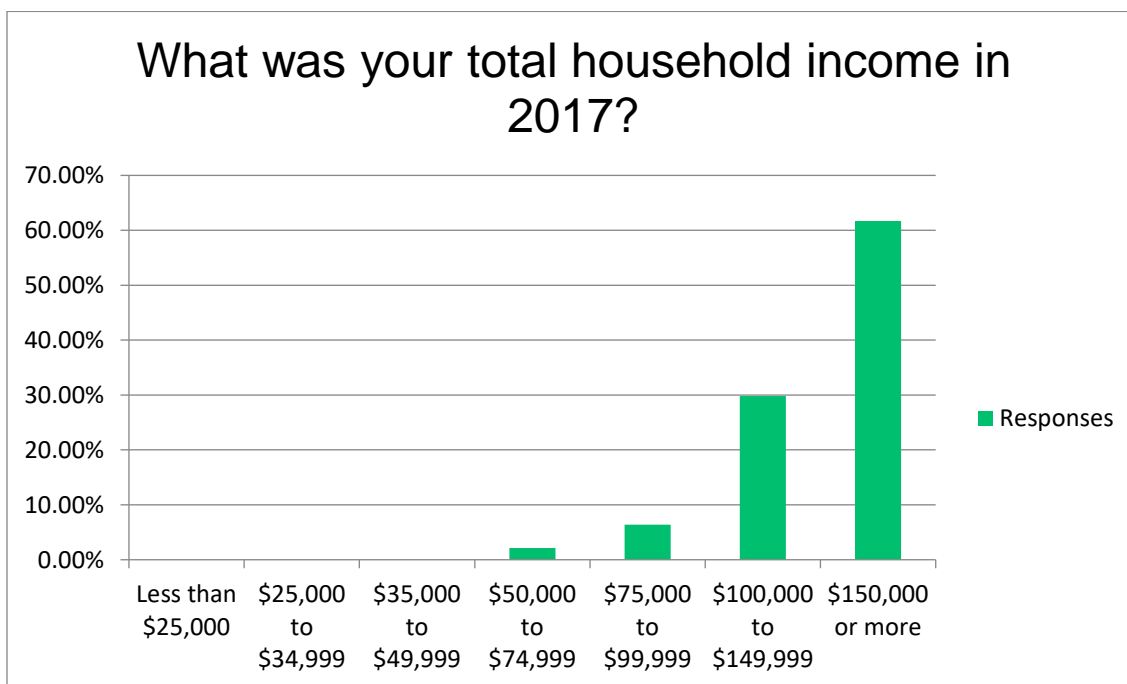
29. What is your age?

Answer Choices	Responses	
18 to 24	0.00%	0
25 to 34	10.17%	6
35 to 44	20.34%	12
45 to 54	25.42%	15
55 or over	44.07%	26
Answered		59
Skipped		3



30. What was your total household income in 2017?

Answer Choices	Responses	
Less than \$25,000	0.00%	0
\$25,000 to \$34,999	0.00%	0
\$35,000 to \$49,999	0.00%	0
\$50,000 to \$74,999	2.13%	1
\$75,000 to \$99,999	6.38%	3
\$100,000 to \$149,999	29.79%	14
\$150,000 or more	61.70%	29
Answered		47
Skipped		15



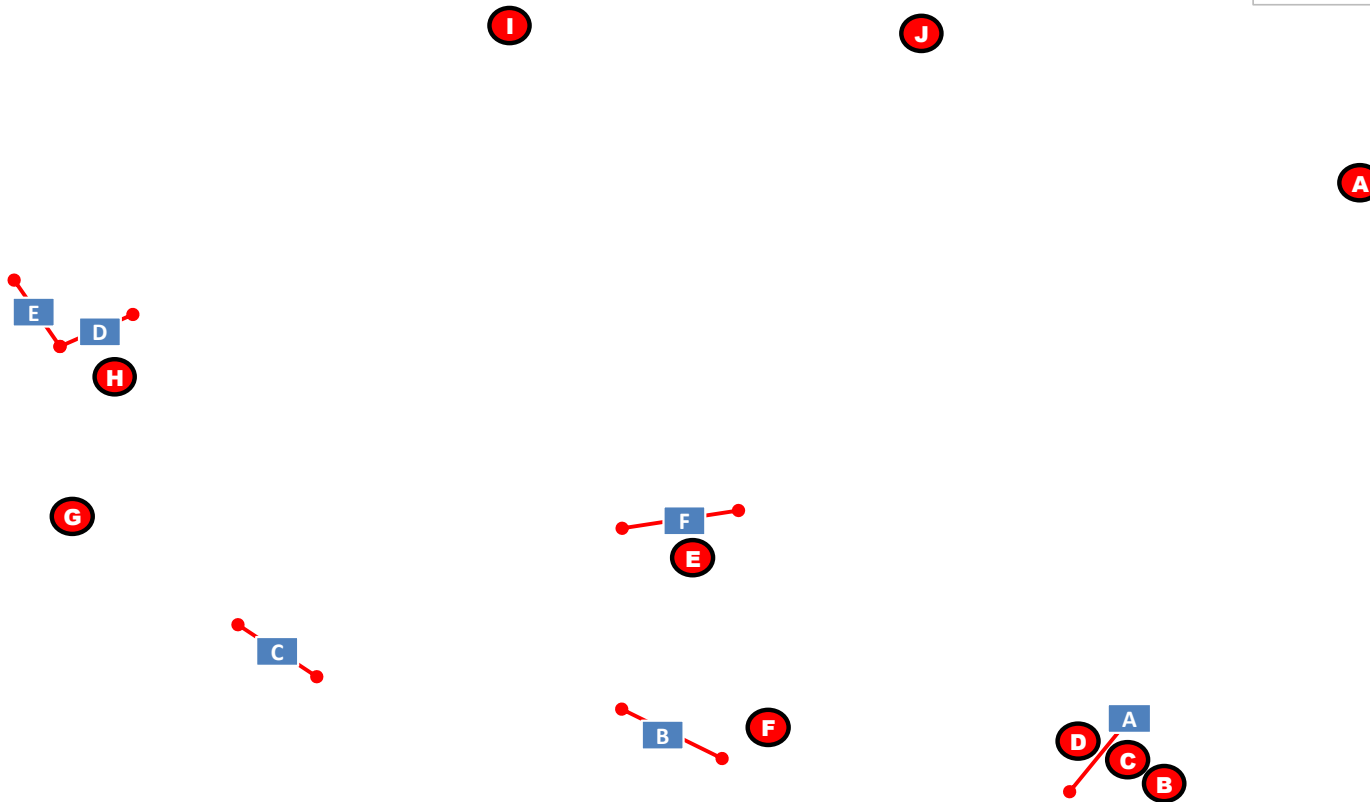
Appendix C-2

2018 Intersection Movement Count

Location Map: 176038 Lexington-Lincoln-Concord-Bedford, MA

Precision Data Industries, LLC 46 Morton Street, Framingham, MA 01702 ph: 508-875-0100 email: datarequests@pdillc.com

(10) 6-9am/3-6pm TMCs
** 2 VCUs @ E and F
(6) 7 Day (v/c/s) ATRs



Client:
Fitzgerald & Halliday, Inc.

Engineer:
M. Morehouse

Site Code:

Date:
Thurs 4/5 thru Wed 4/11/2018

PDI Job #
176038

City, State:
Lexington-Lincoln-Concord-Bedford, MA

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	70	147	0	0	217	0	143	17	0	160	0	60	0	0	60	29	0	2	0	31	468
6:15 AM	94	194	0	0	288	0	133	17	0	150	0	79	0	0	79	23	0	3	0	26	543
6:30 AM	92	257	0	0	349	0	140	18	0	158	0	102	0	0	102	38	0	3	0	41	650
6:45 AM	111	220	0	0	331	0	161	37	0	198	0	105	0	0	105	50	0	11	0	61	695
Total	367	818	0	0	1185	0	577	89	0	666	0	346	0	0	346	140	0	19	0	159	2356
7:00 AM	90	297	0	0	387	1	166	29	0	196	0	141	0	0	141	71	0	11	0	82	806
7:15 AM	107	239	0	0	346	0	209	47	0	256	0	163	0	0	163	63	0	17	0	80	845
7:30 AM	115	251	0	0	366	0	264	44	0	308	0	134	0	0	134	75	0	6	0	81	889
7:45 AM	104	273	0	0	377	0	251	44	0	295	0	173	0	0	173	73	0	14	0	87	932
Total	416	1060	0	0	1476	1	890	164	0	1055	0	611	0	0	611	282	0	48	0	330	3472
8:00 AM	118	202	0	0	320	0	280	45	0	325	0	126	1	0	127	72	0	18	0	90	862
8:15 AM	141	214	0	0	355	0	265	45	0	310	0	118	0	0	118	60	0	19	0	79	862
8:30 AM	135	212	0	0	347	0	287	53	0	340	0	142	0	0	142	64	0	15	0	79	908
8:45 AM	112	184	0	0	296	0	304	68	0	372	0	118	0	0	118	80	0	20	0	100	886
Total	506	812	0	0	1318	0	1136	211	0	1347	0	504	1	0	505	276	0	72	0	348	3518
Grand Total	1289	2690	0	0	3979	1	2603	464	0	3068	0	1461	1	0	1462	698	0	139	0	837	9346
Approach %	32.4	67.6	0.0	0.0		0.0	84.8	15.1	0.0		0.0	99.9	0.1	0.0		83.4	0.0	16.6	0.0		
Total %	13.8	28.8	0.0	0.0	42.6	0.0	27.9	5.0	0.0	32.8	0.0	15.6	0.0	0.0	15.6	7.5	0.0	1.5	0.0	9.0	
Exiting Leg Total	1601					0					3852					3893					9346
Cars	1277	2614	0	0	3891	1	2555	458	0	3014	0	1386	1	0	1387	647	0	134	0	781	9073
% Cars	99.1	97.2	0.0	0.0	97.8	100.0	98.2	98.7	0.0	98.2	0.0	94.9	100.0	0.0	94.9	92.7	0.0	96.4	0.0	93.3	97.1
Exiting Leg Total	1521					0					3719					3833					9073
Heavy Vehicles	12	76	0	0	88	0	48	6	0	54	0	75	0	0	75	51	0	5	0	56	273
% Heavy Vehicles	0.9	2.8	0.0	0.0	2.2	0.0	1.8	1.3	0.0	1.8	0.0	5.1	0.0	0.0	5.1	7.3	0.0	3.6	0.0	6.7	2.9
Exiting Leg Total	80					0					133					60					273

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:45 AM	104	273	0	0	377	0	251	44	0	295	0	173	0	0	173	73	0	14	0	87	932
8:00 AM	118	202	0	0	320	0	280	45	0	325	0	126	1	0	127	72	0	18	0	90	862
8:15 AM	141	214	0	0	355	0	265	45	0	310	0	118	0	0	118	60	0	19	0	79	862
8:30 AM	135	212	0	0	347	0	287	53	0	340	0	142	0	0	142	64	0	15	0	79	908
Total Volume	498	901	0	0	1399	0	1083	187	0	1270	0	559	1	0	560	269	0	66	0	335	3564
% Approach Total	35.6	64.4	0.0	0.0		0.0	85.3	14.7	0.0		0.0	99.8	0.2	0.0		80.3	0.0	19.7	0.0		
PHF	0.883	0.825	0.000	0.000	0.928	0.000	0.943	0.882	0.000	0.934	0.000	0.808	0.250	0.000	0.809	0.921	0.000	0.868	0.000	0.931	0.956
Cars	491	869	0	0	1360	0	1062	184	0	1246	0	527	1	0	528	247	0	63	0	310	3444
Cars %	98.6	96.4	0.0	0.0	97.2	0.0	98.1	98.4	0.0	98.1	0.0	94.3	100.0	0.0	94.3	91.8	0.0	95.5	0.0	92.5	96.6
Heavy Vehicles	7	32	0	0	39	0	21	3	0	24	0	32	0	0	32	22	0	3	0	25	120
Heavy Vehicles %	1.4	3.6	0.0	0.0	2.8	0.0	1.9	1.6	0.0	1.9	0.0	5.7	0.0	0.0	5.7	8.2	0.0	4.5	0.0	7.5	3.4
Cars Enter Leg	491	869	0	0	1360	0	1062	184	0	1246	0	527	1	0	528	247	0	63	0	310	3444
Heavy Enter Leg	7	32	0	0	39	0	21	3	0	24	0	32	0	0	32	22	0	3	0	25	120
Total Entering Leg	498	901	0	0	1399	0	1083	187	0	1270	0	559	1	0	560	269	0	66	0	335	3564
Cars Exiting Leg	590					0					1300					1554					3444
Heavy Exiting Leg	35					0					57					28					120
Total Exiting Leg	625					0					1357					1582					3564

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	70	144	0	0	214	0	143	17	0	160	0	57	0	0	57	28	0	2	0	30	461
6:15 AM	93	187	0	0	280	0	131	16	0	147	0	73	0	0	73	20	0	3	0	23	523
6:30 AM	92	247	0	0	339	0	138	18	0	156	0	94	0	0	94	35	0	3	0	38	627
6:45 AM	111	215	0	0	326	0	154	37	0	191	0	98	0	0	98	45	0	11	0	56	671
Total	366	793	0	0	1159	0	566	88	0	654	0	322	0	0	322	128	0	19	0	147	2282
7:00 AM	88	286	0	0	374	1	162	29	0	192	0	139	0	0	139	66	0	11	0	77	782
7:15 AM	107	238	0	0	345	0	207	46	0	253	0	156	0	0	156	59	0	15	0	74	828
7:30 AM	113	247	0	0	360	0	259	44	0	303	0	128	0	0	128	71	0	6	0	77	868
7:45 AM	104	262	0	0	366	0	244	44	0	288	0	162	0	0	162	68	0	14	0	82	898
Total	412	1033	0	0	1445	1	872	163	0	1036	0	585	0	0	585	264	0	46	0	310	3376
8:00 AM	117	195	0	0	312	0	276	44	0	320	0	121	1	0	122	65	0	17	0	82	836
8:15 AM	136	208	0	0	344	0	258	44	0	302	0	110	0	0	110	55	0	18	0	73	829
8:30 AM	134	204	0	0	338	0	284	52	0	336	0	134	0	0	134	59	0	14	0	73	881
8:45 AM	112	181	0	0	293	0	299	67	0	366	0	114	0	0	114	76	0	20	0	96	869
Total	499	788	0	0	1287	0	1117	207	0	1324	0	479	1	0	480	255	0	69	0	324	3415
Grand Total	1277	2614	0	0	3891	1	2555	458	0	3014	0	1386	1	0	1387	647	0	134	0	781	9073
Approach %	32.8	67.2	0.0	0.0		0.0	84.8	15.2	0.0		0.0	99.9	0.1	0.0		82.8	0.0	17.2	0.0		
Total %	14.1	28.8	0.0	0.0	42.9	0.0	28.2	5.0	0.0	33.2	0.0	15.3	0.0	0.0	15.3	7.1	0.0	1.5	0.0	8.6	
Exiting Leg Total	1521					0					3719					3833					9073

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:45 AM	104	262	0	0	366	0	244	44	0	288	0	162	0	0	162	68	0	14	0	82	898
8:00 AM	117	195	0	0	312	0	276	44	0	320	0	121	1	0	122	65	0	17	0	82	836
8:15 AM	136	208	0	0	344	0	258	44	0	302	0	110	0	0	110	55	0	18	0	73	829
8:30 AM	134	204	0	0	338	0	284	52	0	336	0	134	0	0	134	59	0	14	0	73	881
Total Volume	491	869	0	0	1360	0	1062	184	0	1246	0	527	1	0	528	247	0	63	0	310	3444
% Approach Total	36.1	63.9	0.0	0.0		0.0	85.2	14.8	0.0		0.0	99.8	0.2	0.0		79.7	0.0	20.3	0.0		
PHF	0.903	0.829	0.000	0.000	0.929	0.000	0.935	0.885	0.000	0.927	0.000	0.813	0.250	0.000	0.815	0.908	0.000	0.875	0.000	0.945	0.959
Entering Leg	491	869	0	0	1360	0	1062	184	0	1246	0	527	1	0	528	247	0	63	0	310	3444
Exiting Leg	590					0					1300					1554					3444
Total	1950					1246					1828					1864					6888

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
6:00 AM	0	3	0	0	3	0	0	0	0	0	0	3	0	0	0	3	1	0	0	0	1	7
6:15 AM	1	7	0	0	8	0	2	1	0	3	0	6	0	0	6	3	0	0	0	3	20	
6:30 AM	0	10	0	0	10	0	2	0	0	2	0	8	0	0	8	3	0	0	0	3	23	
6:45 AM	0	5	0	0	5	0	7	0	0	7	0	7	0	0	7	5	0	0	0	5	24	
Total	1	25	0	0	26	0	11	1	0	12	0	24	0	0	24	12	0	0	0	12	74	
7:00 AM	2	11	0	0	13	0	4	0	0	4	0	2	0	0	2	5	0	0	0	5	24	
7:15 AM	0	1	0	0	1	0	2	1	0	3	0	7	0	0	7	4	0	2	0	6	17	
7:30 AM	2	4	0	0	6	0	5	0	0	5	0	6	0	0	6	4	0	0	0	4	21	
7:45 AM	0	11	0	0	11	0	7	0	0	7	0	11	0	0	11	5	0	0	0	5	34	
Total	4	27	0	0	31	0	18	1	0	19	0	26	0	0	26	18	0	2	0	20	96	
8:00 AM	1	7	0	0	8	0	4	1	0	5	0	5	0	0	5	7	0	1	0	8	26	
8:15 AM	5	6	0	0	11	0	7	1	0	8	0	8	0	0	8	5	0	1	0	6	33	
8:30 AM	1	8	0	0	9	0	3	1	0	4	0	8	0	0	8	5	0	1	0	6	27	
8:45 AM	0	3	0	0	3	0	5	1	0	6	0	4	0	0	4	4	0	0	0	4	17	
Total	7	24	0	0	31	0	19	4	0	23	0	25	0	0	25	21	0	3	0	24	103	
Grand Total	12	76	0	0	88	0	48	6	0	54	0	75	0	0	75	51	0	5	0	56	273	
Approach %	13.6	86.4	0.0	0.0		0.0	88.9	11.1	0.0		0.0	100.0	0.0	0.0		91.1	0.0	8.9	0.0			
Total %	4.4	27.8	0.0	0.0	32.2	0.0	17.6	2.2	0.0	19.8	0.0	27.5	0.0	0.0	27.5	18.7	0.0	1.8	0.0	20.5		
Exiting Leg Total	80					0					133					60					273	
Buses	2	17	0	0	19	0	5	1	0	6	0	18	0	0	18	7	0	1	0	8	51	
% Buses	16.7	22.4	0.0	0.0	21.6	0.0	10.4	16.7	0.0	11.1	0.0	24.0	0.0	0.0	24.0	13.7	0.0	20.0	0.0	14.3	18.7	
Exiting Leg Total	19					0					25					7					51	
Single-Unit Trucks	6	45	0	0	51	0	32	5	0	37	0	42	0	0	42	37	0	4	0	41	171	
% Single-Unit	50.0	59.2	0.0	0.0	58.0	0.0	66.7	83.3	0.0	68.5	0.0	56.0	0.0	0.0	56.0	72.5	0.0	80.0	0.0	73.2	62.6	
Exiting Leg Total	46					0					87					38					171	
Articulated Trucks	4	14	0	0	18	0	11	0	0	11	0	15	0	0	15	7	0	0	0	7	51	
% Articulated	33.3	18.4	0.0	0.0	20.5	0.0	22.9	0.0	0.0	20.4	0.0	20.0	0.0	0.0	20.0	13.7	0.0	0.0	0.0	12.5	18.7	
Exiting Leg Total	15					0					21					15					51	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:45 AM	0	11	0	0	11	0	7	0	0	7	0	11	0	0	11	5	0	0	0	5	34
8:00 AM	1	7	0	0	8	0	4	1	0	5	0	5	0	0	5	7	0	1	0	8	26
8:15 AM	5	6	0	0	11	0	7	1	0	8	0	8	0	0	8	5	0	1	0	6	33
8:30 AM	1	8	0	0	9	0	3	1	0	4	0	8	0	0	8	5	0	1	0	6	27
Total Volume	7	32	0	0	39	0	21	3	0	24	0	32	0	0	32	22	0	3	0	25	120
% Approach Total	17.9	82.1	0.0	0.0		0.0	87.5	12.5	0.0		0.0	100.0	0.0	0.0		88.0	0.0	12.0	0.0		
PHF	0.350	0.727	0.000	0.000	0.886	0.000	0.750	0.750	0.000	0.750	0.000	0.727	0.000	0.000	0.727	0.786	0.000	0.750	0.000	0.781	0.882
Buses	0	4	0	0	4	0	3	1	0	4	0	8	0	0	8	3	0	0	0	3	19
Buses %	0.0	12.5	0.0	0.0	10.3	0.0	14.3	33.3	0.0	16.7	0.0	25.0	0.0	0.0	25.0	13.6	0.0	0.0	0.0	12.0	15.8
Single-Unit Trucks	4	20	0	0	24	0	12	2	0	14	0	19	0	0	19	17	0	3	0	20	77
Single-Unit %	57.1	62.5	0.0	0.0	61.5	0.0	57.1	66.7	0.0	58.3	0.0	59.4	0.0	0.0	59.4	77.3	0.0	100.0	0.0	80.0	64.2
Articulated Trucks	3	8	0	0	11	0	6	0	0	6	0	5	0	0	5	2	0	0	0	2	24
Articulated %	42.9	25.0	0.0	0.0	28.2	0.0	28.6	0.0	0.0	25.0	0.0	15.6	0.0	0.0	15.6	9.1	0.0	0.0	0.0	8.0	20.0
Buses	0	4	0	0	4	0	3	1	0	4	0	8	0	0	8	3	0	0	0	3	19
Single-Unit Trucks	4	20	0	0	24	0	12	2	0	14	0	19	0	0	19	17	0	3	0	20	77
Articulated Trucks	3	8	0	0	11	0	6	0	0	6	0	5	0	0	5	2	0	0	0	2	24
Total Entering Leg	7	32	0	0	39	0	21	3	0	24	0	32	0	0	32	22	0	3	0	25	120
Buses	8					0					8					3					19
Single-Unit Trucks	22					0					39					16					77
Articulated Trucks	5					0					10					9					24
Total Exiting Leg	35					0					57					28					120

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	57	112	0	0	169	0	113	15	0	128	0	50	0	0	50	27	0	2	0	29	376
6:15 AM	77	161	0	0	238	0	113	16	0	129	0	60	0	0	60	17	0	3	0	20	447
6:30 AM	80	213	0	0	293	0	121	17	0	138	0	81	0	0	81	31	0	2	0	33	545
6:45 AM	99	186	0	0	285	0	135	33	0	168	0	84	0	0	84	37	0	10	0	47	584
Total	313	672	0	0	985	0	482	81	0	563	0	275	0	0	275	112	0	17	0	129	1952
7:00 AM	83	258	0	0	341	1	147	28	0	176	0	122	0	0	122	56	0	10	0	66	705
7:15 AM	97	205	0	0	302	0	186	43	0	229	0	150	0	0	150	53	0	15	0	68	749
7:30 AM	103	218	0	0	321	0	242	42	0	284	0	111	0	0	111	67	0	5	0	72	788
7:45 AM	93	232	0	0	325	0	232	42	0	274	0	146	0	0	146	61	0	13	0	74	819
Total	376	913	0	0	1289	1	807	155	0	963	0	529	0	0	529	237	0	43	0	280	3061
8:00 AM	109	179	0	0	288	0	255	44	0	299	0	106	1	0	107	59	0	15	0	74	768
8:15 AM	126	197	0	0	323	0	243	43	0	286	0	102	0	0	102	49	0	15	0	64	775
8:30 AM	128	187	0	0	315	0	266	51	0	317	0	116	0	0	116	52	0	11	0	63	811
8:45 AM	104	165	0	0	269	0	288	64	0	352	0	98	0	0	98	65	0	19	0	84	803
Total	467	728	0	0	1195	0	1052	202	0	1254	0	422	1	0	423	225	0	60	0	285	3157
Grand Total	1156	2313	0	0	3469	1	2341	438	0	2780	0	1226	1	0	1227	574	0	120	0	694	8170
Approach %	33.3	66.7	0.0	0.0		0.0	84.2	15.8	0.0		0.0	99.9	0.1	0.0		82.7	0.0	17.3	0.0		
Total %	14.1	28.3	0.0	0.0	42.5	0.0	28.7	5.4	0.0	34.0	0.0	15.0	0.0	0.0	15.0	7.0	0.0	1.5	0.0	8.5	
Exiting Leg Total	1347					0					3325					3498					8170

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:45 AM	93	232	0	0	325	0	232	42	0	274	0	146	0	0	146	61	0	13	0	74	819
8:00 AM	109	179	0	0	288	0	255	44	0	299	0	106	1	0	107	59	0	15	0	74	768
8:15 AM	126	197	0	0	323	0	243	43	0	286	0	102	0	0	102	49	0	15	0	64	775
8:30 AM	128	187	0	0	315	0	266	51	0	317	0	116	0	0	116	52	0	11	0	63	811
Total Volume	456	795	0	0	1251	0	996	180	0	1176	0	470	1	0	471	221	0	54	0	275	3173
% Approach Total	36.5	63.5	0.0	0.0		0.0	84.7	15.3	0.0		0.0	99.8	0.2	0.0		80.4	0.0	19.6	0.0		
PHF	0.891	0.857	0.000	0.000	0.962	0.000	0.936	0.882	0.000	0.927	0.000	0.805	0.250	0.000	0.807	0.906	0.000	0.900	0.000	0.929	0.969
Entering Leg	456	795	0	0	1251	0	996	180	0	1176	0	470	1	0	471	221	0	54	0	275	3173
Exiting Leg	524					0					1196					1453					3173
Total	1775					1176					1667					1728					6346

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Light Goods Vehicle**



	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	13	32	0	0	45	0	30	2	0	32	0	7	0	0	7	1	0	0	0	1	85
6:15 AM	16	26	0	0	42	0	18	0	0	18	0	13	0	0	13	3	0	0	0	3	76
6:30 AM	12	34	0	0	46	0	17	1	0	18	0	13	0	0	13	4	0	1	0	5	82
6:45 AM	12	29	0	0	41	0	19	4	0	23	0	14	0	0	14	8	0	1	0	9	87
Total	53	121	0	0	174	0	84	7	0	91	0	47	0	0	47	16	0	2	0	18	330
7:00 AM	5	28	0	0	33	0	15	1	0	16	0	17	0	0	17	10	0	1	0	11	77
7:15 AM	10	33	0	0	43	0	21	3	0	24	0	6	0	0	6	6	0	0	0	6	79
7:30 AM	10	29	0	0	39	0	17	2	0	19	0	17	0	0	17	4	0	1	0	5	80
7:45 AM	11	30	0	0	41	0	12	2	0	14	0	16	0	0	16	7	0	1	0	8	79
Total	36	120	0	0	156	0	65	8	0	73	0	56	0	0	56	27	0	3	0	30	315
8:00 AM	8	15	0	0	23	0	21	0	0	21	0	15	0	0	15	6	0	2	0	8	67
8:15 AM	10	11	0	0	21	0	15	1	0	16	0	8	0	0	8	6	0	3	0	9	54
8:30 AM	6	17	0	0	23	0	18	1	0	19	0	18	0	0	18	7	0	3	0	10	70
8:45 AM	8	16	0	0	24	0	11	3	0	14	0	16	0	0	16	11	0	1	0	12	66
Total	32	59	0	0	91	0	65	5	0	70	0	57	0	0	57	30	0	9	0	39	257
Grand Total	121	300	0	0	421	0	214	20	0	234	0	160	0	0	160	73	0	14	0	87	902
Approach %	28.7	71.3	0.0	0.0		0.0	91.5	8.5	0.0		0.0	100.0	0.0	0.0		83.9	0.0	16.1	0.0		
Total %	13.4	33.3	0.0	0.0	46.7	0.0	23.7	2.2	0.0	25.9	0.0	17.7	0.0	0.0	17.7	8.1	0.0	1.6	0.0	9.6	
Exiting Leg Total	174					0					393					335					902

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	13	32	0	0	45	0	30	2	0	32	0	7	0	0	7	1	0	0	0	1	85
6:15 AM	16	26	0	0	42	0	18	0	0	18	0	13	0	0	13	3	0	0	0	3	76
6:30 AM	12	34	0	0	46	0	17	1	0	18	0	13	0	0	13	4	0	1	0	5	82
6:45 AM	12	29	0	0	41	0	19	4	0	23	0	14	0	0	14	8	0	1	0	9	87
Total Volume	53	121	0	0	174	0	84	7	0	91	0	47	0	0	47	16	0	2	0	18	330
% Approach Total	30.5	69.5	0.0	0.0		0.0	92.3	7.7	0.0		0.0	100.0	0.0	0.0		88.9	0.0	11.1	0.0		
PHF	0.828	0.890	0.000	0.000	0.946	0.000	0.700	0.438	0.000	0.711	0.000	0.839	0.000	0.000	0.839	0.500	0.000	0.500	0.000	0.500	0.948
Entering Leg	53	121	0	0	174	0	84	7	0	91	0	47	0	0	47	16	0	2	0	18	330
Exiting Leg	49					0					144					137					330
Total	223					91					191					155					660

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
6:15 AM	1	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
6:30 AM	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
6:45 AM	0	3	0	0	3	0	1	0	0	1	0	1	0	0	1	2	0	0	0	2	7
Total	1	10	0	0	11	0	1	0	0	1	0	4	0	0	4	2	0	0	0	2	18
7:00 AM	1	2	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
7:15 AM	0	0	0	0	0	0	1	0	0	1	0	3	0	0	3	0	0	1	0	1	5
7:30 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	3
7:45 AM	0	0	0	0	0	0	2	0	0	2	0	2	0	0	2	1	0	0	0	1	5
Total	1	3	0	0	4	0	3	0	0	3	0	7	0	0	7	3	0	1	0	4	18
8:00 AM	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	2	0	0	0	2	5
8:15 AM	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
8:30 AM	0	1	0	0	1	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	4
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	0	4	0	0	4	0	1	1	0	2	0	7	0	0	7	2	0	0	0	2	15
Grand Total	2	17	0	0	19	0	5	1	0	6	0	18	0	0	18	7	0	1	0	8	51
Approach %	10.5	89.5	0.0	0.0		0.0	83.3	16.7	0.0		0.0	100.0	0.0	0.0		87.5	0.0	12.5	0.0		
Total %	3.9	33.3	0.0	0.0	37.3	0.0	9.8	2.0	0.0	11.8	0.0	35.3	0.0	0.0	35.3	13.7	0.0	2.0	0.0	15.7	
Exiting Leg Total	19					0					25					7					51

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:30 AM	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
6:45 AM	0	3	0	0	3	0	1	0	0	1	0	1	0	0	1	2	0	0	0	2	7
7:00 AM	1	2	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
7:15 AM	0	0	0	0	0	0	1	0	0	1	0	3	0	0	3	0	0	1	0	1	5
Total Volume	1	8	0	0	9	0	2	0	0	2	0	8	0	0	8	2	0	1	0	3	22
% Approach Total	11.1	88.9	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		66.7	0.0	33.3	0.0		
PHF	0.250	0.667	0.000	0.000	0.750	0.000	0.500	0.000	0.000	0.500	0.000	0.667	0.000	0.000	0.667	0.250	0.000	0.250	0.000	0.375	0.786
Entering Leg	1	8	0	0	9	0	2	0	0	2	0	8	0	0	8	2	0	1	0	3	22
Exiting Leg					9					0					10					3	22
Total	18					2					18					6					44

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
6:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	3
6:15 AM	0	5	0	0	5	0	2	1	0	3	0	5	0	0	5	3	0	0	0	0	3	16
6:30 AM	0	6	0	0	6	0	2	0	0	2	0	3	0	0	3	2	0	0	0	0	2	13
6:45 AM	0	1	0	0	1	0	4	0	0	4	0	4	0	0	4	3	0	0	0	0	3	12
Total	0	13	0	0	13	0	8	1	0	9	0	13	0	0	13	9	0	0	0	0	9	44
7:00 AM	1	6	0	0	7	0	3	0	0	3	0	0	0	0	0	4	0	0	0	0	4	14
7:15 AM	0	1	0	0	1	0	0	1	0	1	0	3	0	0	3	4	0	1	0	0	5	10
7:30 AM	1	2	0	0	3	0	4	0	0	4	0	4	0	0	4	0	0	0	0	0	0	11
7:45 AM	0	8	0	0	8	0	3	0	0	3	0	4	0	0	4	4	0	0	0	0	4	19
Total	2	17	0	0	19	0	10	1	0	11	0	11	0	0	11	12	0	1	0	0	13	54
8:00 AM	0	3	0	0	3	0	2	0	0	2	0	4	0	0	4	5	0	1	0	0	6	15
8:15 AM	4	4	0	0	8	0	6	1	0	7	0	5	0	0	5	4	0	1	0	0	5	25
8:30 AM	0	5	0	0	5	0	1	1	0	2	0	6	0	0	6	4	0	1	0	0	5	18
8:45 AM	0	3	0	0	3	0	5	1	0	6	0	3	0	0	3	3	0	0	0	0	3	15
Total	4	15	0	0	19	0	14	3	0	17	0	18	0	0	18	16	0	3	0	0	19	73
Grand Total	6	45	0	0	51	0	32	5	0	37	0	42	0	0	42	37	0	4	0	0	41	171
Approach %	11.8	88.2	0.0	0.0		0.0	86.5	13.5	0.0		0.0	100.0	0.0	0.0		90.2	0.0	9.8	0.0			
Total %	3.5	26.3	0.0	0.0	29.8	0.0	18.7	2.9	0.0	21.6	0.0	24.6	0.0	0.0	24.6	21.6	0.0	2.3	0.0	24.0		
Exiting Leg Total	46					0					87					38					171	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:45 AM	0	8	0	0	8	0	3	0	0	3	0	4	0	0	4	4	0	0	0	4	19
8:00 AM	0	3	0	0	3	0	2	0	0	2	0	4	0	0	4	5	0	1	0	6	15
8:15 AM	4	4	0	0	8	0	6	1	0	7	0	5	0	0	5	4	0	1	0	5	25
8:30 AM	0	5	0	0	5	0	1	1	0	2	0	6	0	0	6	4	0	1	0	5	18
Total Volume	4	20	0	0	24	0	12	2	0	14	0	19	0	0	19	17	0	3	0	20	77
% Approach Total	16.7	83.3	0.0	0.0		0.0	85.7	14.3	0.0		0.0	100.0	0.0	0.0		85.0	0.0	15.0	0.0		
PHF	0.250	0.625	0.000	0.000	0.750	0.000	0.500	0.500	0.000	0.500	0.000	0.792	0.000	0.000	0.792	0.850	0.000	0.750	0.000	0.833	0.770
Entering Leg	4	20	0	0	24	0	12	2	0	14	0	19	0	0	19	17	0	3	0	20	77
Exiting Leg					22					0					39					16	77
Total	46					14					58					36					154

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
6:30 AM	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	1	0	0	0	1	5
6:45 AM	0	1	0	0	1	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0	5
Total	0	2	0	0	2	0	2	0	0	2	0	7	0	0	7	1	0	0	0	1	12
7:00 AM	0	3	0	0	3	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	5
7:15 AM	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	2
7:30 AM	1	1	0	0	2	0	1	0	0	1	0	2	0	0	2	2	0	0	0	2	7
7:45 AM	0	3	0	0	3	0	2	0	0	2	0	5	0	0	5	0	0	0	0	0	10
Total	1	7	0	0	8	0	5	0	0	5	0	8	0	0	8	3	0	0	0	3	24
8:00 AM	1	3	0	0	4	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	6
8:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	3
8:30 AM	1	2	0	0	3	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	5
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	3	5	0	0	8	0	4	0	0	4	0	0	0	0	0	3	0	0	0	3	15
Grand Total	4	14	0	0	18	0	11	0	0	11	0	15	0	0	15	7	0	0	0	7	51
Approach %	22.2	77.8	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		100.0	0.0	0.0	0.0		
Total %	7.8	27.5	0.0	0.0	35.3	0.0	21.6	0.0	0.0	21.6	0.0	29.4	0.0	0.0	29.4	13.7	0.0	0.0	0.0	13.7	
Exiting Leg Total	15					0					21					15					51

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	1	1	0	0	2	0	1	0	0	1	0	2	0	0	2	2	0	0	0	2	7
7:45 AM	0	3	0	0	3	0	2	0	0	2	0	5	0	0	5	0	0	0	0	0	10
8:00 AM	1	3	0	0	4	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	6
8:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	3
Total Volume	3	7	0	0	10	0	6	0	0	6	0	7	0	0	7	3	0	0	0	3	26
% Approach Total	30.0	70.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		100.0	0.0	0.0	0.0		
PHF	0.750	0.583	0.000	0.000	0.625	0.000	0.750	0.000	0.000	0.750	0.000	0.350	0.000	0.000	0.350	0.375	0.000	0.000	0.000	0.375	0.650
Entering Leg	3	7	0	0	10	0	6	0	0	6	0	7	0	0	7	3	0	0	0	3	26
Exiting Leg					7					0					10					9	26
Total	17					6					17					12					52

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	
Exiting Leg Total	1							0							0							0							1

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
Exiting Leg	1							0							0							0							1
Total	1							0							0							1							2

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue							Total	
	from North							from East							from South							from West								
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	2
6:15 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:45 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2		
Total	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	2	5	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1		
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Total	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	1	3		
8:00 AM	0	0	0	0	0	0	0	0	0	0	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1		
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	2	
Total	0	0	0	0	0	0	0	0	0	0	2	1	3	3	0	0	0	0	1	1	2	0	0	0	0	0	0	0	5	
Grand Total	0	0	0	0	1	1	2	0	0	0	0	2	3	5	0	0	0	0	2	1	3	0	0	0	0	1	2	3	13	
Approach %	0	0	0	0	50	50		0	0	0	0	40	60		0	0	0	0	66.7	33.3		0	0	0	0	33.3	66.7			
Total %	0	0	0	0	7.69	7.69	15.4	0	0	0	0	15.4	23.1	38.5	0	0	0	0	15.4	7.69	23.1	0	0	0	0	7.69	15.4	23.1		
Exiting Leg Total	2							5							3							3							13	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue								
	from North							from East							from South							from West								
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	2
6:15 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	
Total Volume	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	2	5	
% Approach Total	0.0	0.0	0.0	0.0	50.0	50.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0	50.0	50.0			
PHF	0.000	0.000	0.000	0.000	0.250	0.250	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.250	0.500	0.625	
Entering Leg	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	2	5	
Exiting Leg	2							0							1							2							5	
Total	4							0							2							4							10	

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	26	199	0	0	225	2	66	27	0	95	0	171	0	0	171	205	0	114	0	319	810
3:15 PM	29	172	0	0	201	0	61	25	0	86	0	195	0	0	195	176	0	82	0	258	740
3:30 PM	18	150	0	0	168	2	70	22	0	94	0	212	0	0	212	206	0	108	0	314	788
3:45 PM	43	163	0	0	206	0	60	27	0	87	0	252	0	0	252	162	0	82	0	244	789
Total	116	684	0	0	800	4	257	101	0	362	0	830	0	0	830	749	0	386	0	1135	3127
4:00 PM	32	173	0	0	205	1	81	24	0	106	0	218	0	0	218	231	0	112	0	343	872
4:15 PM	33	152	0	0	185	2	80	21	0	103	0	223	0	0	223	241	0	93	0	334	845
4:30 PM	22	185	0	0	207	0	83	35	0	118	0	201	0	0	201	212	0	106	0	318	844
4:45 PM	33	166	0	0	199	0	100	29	0	129	0	209	0	0	209	226	0	91	0	317	854
Total	120	676	0	0	796	3	344	109	0	456	0	851	0	0	851	910	0	402	0	1312	3415
5:00 PM	37	176	0	0	213	0	106	42	0	148	0	242	0	0	242	232	0	81	0	313	916
5:15 PM	28	180	0	0	208	0	130	28	0	158	0	206	0	0	206	245	0	97	0	342	914
5:30 PM	41	160	0	0	201	0	134	30	0	164	0	167	0	0	167	176	0	60	0	236	768
5:45 PM	31	131	0	0	162	1	118	28	0	147	0	191	0	0	191	172	0	61	1	234	734
Total	137	647	0	0	784	1	488	128	0	617	0	806	0	0	806	825	0	299	1	1125	3332
Grand Total	373	2007	0	0	2380	8	1089	338	0	1435	0	2487	0	0	2487	2484	0	1087	1	3572	9874
Approach %	15.7	84.3	0.0	0.0		0.6	75.9	23.6	0.0		0.0	100.0	0.0	0.0		69.5	0.0	30.4	0.0		
Total %	3.8	20.3	0.0	0.0	24.1	0.1	11.0	3.4	0.0	14.5	0.0	25.2	0.0	0.0	25.2	25.2	0.0	11.0	0.0	36.2	
Exiting Leg Total	3582					0					4829					1463					9874
Cars	367	1978	0	0	2345	8	1051	333	0	1392	0	2441	0	0	2441	2457	0	1079	1	3537	9715
% Cars	98.4	98.6	0.0	0.0	98.5	100.0	96.5	98.5	0.0	97.0	0.0	98.2	0.0	0.0	98.2	98.9	0.0	99.3	100.0	99.0	98.4
Exiting Leg Total	3528					0					4768					1419					9715
Heavy Vehicles	6	29	0	0	35	0	38	5	0	43	0	46	0	0	46	27	0	8	0	35	159
% Heavy Vehicles	1.6	1.4	0.0	0.0	1.5	0.0	3.5	1.5	0.0	3.0	0.0	1.8	0.0	0.0	1.8	1.1	0.0	0.7	0.0	1.0	1.6
Exiting Leg Total	54					0					61					44					159

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:30 PM	22	185	0	0	207	0	83	35	0	118	0	201	0	0	201	212	0	106	0	318	844
4:45 PM	33	166	0	0	199	0	100	29	0	129	0	209	0	0	209	226	0	91	0	317	854
5:00 PM	37	176	0	0	213	0	106	42	0	148	0	242	0	0	242	232	0	81	0	313	916
5:15 PM	28	180	0	0	208	0	130	28	0	158	0	206	0	0	206	245	0	97	0	342	914
Total Volume	120	707	0	0	827	0	419	134	0	553	0	858	0	0	858	915	0	375	0	1290	3528
% Approach Total	14.5	85.5	0.0	0.0		0.0	75.8	24.2	0.0		0.0	100.0	0.0	0.0		70.9	0.0	29.1	0.0		
PHF	0.811	0.955	0.000	0.000	0.971	0.000	0.806	0.798	0.000	0.875	0.000	0.886	0.000	0.000	0.886	0.934	0.000	0.884	0.000	0.943	0.963
Cars	117	695	0	0	812	0	410	133	0	543	0	845	0	0	845	908	0	374	0	1282	3482
Cars %	97.5	98.3	0.0	0.0	98.2	0.0	97.9	99.3	0.0	98.2	0.0	98.5	0.0	0.0	98.5	99.2	0.0	99.7	0.0	99.4	98.7
Heavy Vehicles	3	12	0	0	15	0	9	1	0	10	0	13	0	0	13	7	0	1	0	8	46
Heavy Vehicles %	2.5	1.7	0.0	0.0	1.8	0.0	2.1	0.7	0.0	1.8	0.0	1.5	0.0	0.0	1.5	0.8	0.0	0.3	0.0	0.6	1.3
Cars Enter Leg	117	695	0	0	812	0	410	133	0	543	0	845	0	0	845	908	0	374	0	1282	3482
Heavy Enter Leg	3	12	0	0	15	0	9	1	0	10	0	13	0	0	13	7	0	1	0	8	46
Total Entering Leg	120	707	0	0	827	0	419	134	0	553	0	858	0	0	858	915	0	375	0	1290	3528
Cars Exiting Leg	1219					0					1736					527					3482
Heavy Exiting Leg	14					0					20					12					46
Total Exiting Leg	1233					0					1756					539					3528

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	25	195	0	0	220	2	60	27	0	89	0	169	0	0	169	199	0	113	0	312	790
3:15 PM	29	171	0	0	200	0	57	25	0	82	0	187	0	0	187	175	0	82	0	257	726
3:30 PM	18	149	0	0	167	2	68	22	0	92	0	206	0	0	206	204	0	108	0	312	777
3:45 PM	41	161	0	0	202	0	58	27	0	85	0	247	0	0	247	161	0	82	0	243	777
Total	113	676	0	0	789	4	243	101	0	348	0	809	0	0	809	739	0	385	0	1124	3070
4:00 PM	32	168	0	0	200	1	75	23	0	99	0	215	0	0	215	229	0	110	0	339	853
4:15 PM	33	148	0	0	181	2	78	21	0	101	0	217	0	0	217	238	0	89	0	327	826
4:30 PM	22	184	0	0	206	0	78	35	0	113	0	198	0	0	198	209	0	105	0	314	831
4:45 PM	31	164	0	0	195	0	99	28	0	127	0	206	0	0	206	223	0	91	0	314	842
Total	118	664	0	0	782	3	330	107	0	440	0	836	0	0	836	899	0	395	0	1294	3352
5:00 PM	37	172	0	0	209	0	106	42	0	148	0	237	0	0	237	232	0	81	0	313	907
5:15 PM	27	175	0	0	202	0	127	28	0	155	0	204	0	0	204	244	0	97	0	341	902
5:30 PM	41	160	0	0	201	0	130	27	0	157	0	164	0	0	164	174	0	60	0	234	756
5:45 PM	31	131	0	0	162	1	115	28	0	144	0	191	0	0	191	169	0	61	1	231	728
Total	136	638	0	0	774	1	478	125	0	604	0	796	0	0	796	819	0	299	1	1119	3293
Grand Total	367	1978	0	0	2345	8	1051	333	0	1392	0	2441	0	0	2441	2457	0	1079	1	3537	9715
Approach %	15.7	84.3	0.0	0.0		0.6	75.5	23.9	0.0		0.0	100.0	0.0	0.0		69.5	0.0	30.5	0.0		
Total %	3.8	20.4	0.0	0.0	24.1	0.1	10.8	3.4	0.0	14.3	0.0	25.1	0.0	0.0	25.1	25.3	0.0	11.1	0.0	36.4	
Exiting Leg Total	3528					0					4768					1419					9715

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:30 PM	22	184	0	0	206	0	78	35	0	113	0	198	0	0	198	209	0	105	0	314	831
4:45 PM	31	164	0	0	195	0	99	28	0	127	0	206	0	0	206	223	0	91	0	314	842
5:00 PM	37	172	0	0	209	0	106	42	0	148	0	237	0	0	237	232	0	81	0	313	907
5:15 PM	27	175	0	0	202	0	127	28	0	155	0	204	0	0	204	244	0	97	0	341	902
Total Volume	117	695	0	0	812	0	410	133	0	543	0	845	0	0	845	908	0	374	0	1282	3482
% Approach Total	14.4	85.6	0.0	0.0		0.0	75.5	24.5	0.0		0.0	100.0	0.0	0.0		70.8	0.0	29.2	0.0		
PHF	0.791	0.944	0.000	0.000	0.971	0.000	0.807	0.792	0.000	0.876	0.000	0.891	0.000	0.000	0.891	0.930	0.000	0.890	0.000	0.940	0.960
Entering Leg	117	695	0	0	812	0	410	133	0	543	0	845	0	0	845	908	0	374	0	1282	3482
Exiting Leg	1219					0					1736					527					3482
Total	2031					543					2581					1809					6964

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	1	4	0	0	5	0	6	0	0	6	0	2	0	0	2	6	0	1	0	7	20
3:15 PM	0	1	0	0	1	0	4	0	0	4	0	8	0	0	8	1	0	0	0	1	14
3:30 PM	0	1	0	0	1	0	2	0	0	2	0	6	0	0	6	2	0	0	0	2	11
3:45 PM	2	2	0	0	4	0	2	0	0	2	0	5	0	0	5	1	0	0	0	1	12
Total	3	8	0	0	11	0	14	0	0	14	0	21	0	0	21	10	0	1	0	11	57
4:00 PM	0	5	0	0	5	0	6	1	0	7	0	3	0	0	3	2	0	2	0	4	19
4:15 PM	0	4	0	0	4	0	2	0	0	2	0	6	0	0	6	3	0	4	0	7	19
4:30 PM	0	1	0	0	1	0	5	0	0	5	0	3	0	0	3	3	0	1	0	4	13
4:45 PM	2	2	0	0	4	0	1	1	0	2	0	3	0	0	3	3	0	0	0	3	12
Total	2	12	0	0	14	0	14	2	0	16	0	15	0	0	15	11	0	7	0	18	63
5:00 PM	0	4	0	0	4	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	9
5:15 PM	1	5	0	0	6	0	3	0	0	3	0	2	0	0	2	1	0	0	0	1	12
5:30 PM	0	0	0	0	0	0	4	3	0	7	0	3	0	0	3	2	0	0	0	2	12
5:45 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3	0	0	0	3	6
Total	1	9	0	0	10	0	10	3	0	13	0	10	0	0	10	6	0	0	0	6	39
Grand Total	6	29	0	0	35	0	38	5	0	43	0	46	0	0	46	27	0	8	0	35	159
Approach %	17.1	82.9	0.0	0.0		0.0	88.4	11.6	0.0		0.0	100.0	0.0	0.0		77.1	0.0	22.9	0.0		
Total %	3.8	18.2	0.0	0.0	22.0	0.0	23.9	3.1	0.0	27.0	0.0	28.9	0.0	0.0	28.9	17.0	0.0	5.0	0.0	22.0	
Exiting Leg Total	54					0					61					44					159
Buses	2	5	0	0	7	0	7	0	0	7	0	10	0	0	10	5	0	0	0	5	29
% Buses	33.3	17.2	0.0	0.0	20.0	0.0	18.4	0.0	0.0	16.3	0.0	21.7	0.0	0.0	21.7	18.5	0.0	0.0	0.0	14.3	18.2
Exiting Leg Total	10					0					10					9					29
Single-Unit Trucks	3	18	0	0	21	0	26	5	0	31	0	31	0	0	31	17	0	3	0	20	103
% Single-Unit	50.0	62.1	0.0	0.0	60.0	0.0	68.4	100.0	0.0	72.1	0.0	67.4	0.0	0.0	67.4	63.0	0.0	37.5	0.0	57.1	64.8
Exiting Leg Total	34					0					40					29					103
Articulated Trucks	1	6	0	0	7	0	5	0	0	5	0	5	0	0	5	5	0	5	0	10	27
% Articulated	16.7	20.7	0.0	0.0	20.0	0.0	13.2	0.0	0.0	11.6	0.0	10.9	0.0	0.0	10.9	18.5	0.0	62.5	0.0	28.6	17.0
Exiting Leg Total	10					0					11					6					27

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:45 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:45 PM	2	2	0	0	4	0	2	0	0	2	0	5	0	0	5	1	0	0	0	1	12
4:00 PM	0	5	0	0	5	0	6	1	0	7	0	3	0	0	3	2	0	2	0	4	19
4:15 PM	0	4	0	0	4	0	2	0	0	2	0	6	0	0	6	3	0	4	0	7	19
4:30 PM	0	1	0	0	1	0	5	0	0	5	0	3	0	0	3	3	0	1	0	4	13
Total Volume	2	12	0	0	14	0	15	1	0	16	0	17	0	0	17	9	0	7	0	16	63
% Approach Total	14.3	85.7	0.0	0.0		0.0	93.8	6.3	0.0		0.0	100.0	0.0	0.0		56.3	0.0	43.8	0.0		
PHF	0.250	0.600	0.000	0.000	0.700	0.000	0.625	0.250	0.000	0.571	0.000	0.708	0.000	0.000	0.708	0.750	0.000	0.438	0.000	0.571	0.829
Buses	0	2	0	0	2	0	1	0	0	1	0	3	0	0	3	2	0	0	0	2	8
Buses %	0.0	16.7	0.0	0.0	14.3	0.0	6.7	0.0	0.0	6.3	0.0	17.6	0.0	0.0	17.6	22.2	0.0	0.0	0.0	12.5	12.7
Single-Unit Trucks	2	8	0	0	10	0	13	1	0	14	0	13	0	0	13	5	0	3	0	8	45
Single-Unit %	100.0	66.7	0.0	0.0	71.4	0.0	86.7	100.0	0.0	87.5	0.0	76.5	0.0	0.0	76.5	55.6	0.0	42.9	0.0	50.0	71.4
Articulated Trucks	0	2	0	0	2	0	1	0	0	1	0	1	0	0	1	2	0	4	0	6	10
Articulated %	0.0	16.7	0.0	0.0	14.3	0.0	6.7	0.0	0.0	6.3	0.0	5.9	0.0	0.0	5.9	22.2	0.0	57.1	0.0	37.5	15.9
Buses	0	2	0	0	2	0	1	0	0	1	0	3	0	0	3	2	0	0	0	2	8
Single-Unit Trucks	2	8	0	0	10	0	13	1	0	14	0	13	0	0	13	5	0	3	0	8	45
Articulated Trucks	0	2	0	0	2	0	1	0	0	1	0	1	0	0	1	2	0	4	0	6	10
Total Entering Leg	2	12	0	0	14	0	15	1	0	16	0	17	0	0	17	9	0	7	0	16	63
Buses	3					0					4					1					8
Single-Unit Trucks	16					0					14					15					45
Articulated Trucks	5					0					4					1					10
Total Exiting Leg	24					0					22					17					63

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	23	173	0	0	196	2	56	24	0	82	0	143	0	0	143	179	0	97	0	276	697
3:15 PM	26	152	0	0	178	0	50	23	0	73	0	162	0	0	162	161	0	68	0	229	642
3:30 PM	17	136	0	0	153	2	60	20	0	82	0	185	0	0	185	189	0	95	0	284	704
3:45 PM	38	152	0	0	190	0	54	27	0	81	0	216	0	0	216	151	0	69	0	220	707
Total	104	613	0	0	717	4	220	94	0	318	0	706	0	0	706	680	0	329	0	1009	2750
4:00 PM	31	151	0	0	182	1	63	23	0	87	0	187	0	0	187	219	0	91	0	310	766
4:15 PM	32	141	0	0	173	1	71	20	0	92	0	189	0	0	189	229	0	76	0	305	759
4:30 PM	21	168	0	0	189	0	69	30	0	99	0	185	0	0	185	202	0	96	0	298	771
4:45 PM	31	159	0	0	190	0	91	27	0	118	0	188	0	0	188	213	0	83	0	296	792
Total	115	619	0	0	734	2	294	100	0	396	0	749	0	0	749	863	0	346	0	1209	3088
5:00 PM	37	168	0	0	205	0	96	37	0	133	0	214	0	0	214	220	0	76	0	296	848
5:15 PM	23	163	0	0	186	0	119	25	0	144	0	185	0	0	185	234	0	91	0	325	840
5:30 PM	40	149	0	0	189	0	118	26	0	144	0	156	0	0	156	168	0	58	0	226	715
5:45 PM	30	119	0	0	149	1	108	26	0	135	0	179	0	0	179	159	0	57	1	217	680
Total	130	599	0	0	729	1	441	114	0	556	0	734	0	0	734	781	0	282	1	1064	3083
Grand Total	349	1831	0	0	2180	7	955	308	0	1270	0	2189	0	0	2189	2324	0	957	1	3282	8921
Approach %	16.0	84.0	0.0	0.0		0.6	75.2	24.3	0.0		0.0	100.0	0.0	0.0		70.8	0.0	29.2	0.0		
Total %	3.9	20.5	0.0	0.0	24.4	0.1	10.7	3.5	0.0	14.2	0.0	24.5	0.0	0.0	24.5	26.1	0.0	10.7	0.0	36.8	
Exiting Leg Total	3153					0					4463					1305					8921

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:30 PM	21	168	0	0	189	0	69	30	0	99	0	185	0	0	185	202	0	96	0	298	771
4:45 PM	31	159	0	0	190	0	91	27	0	118	0	188	0	0	188	213	0	83	0	296	792
5:00 PM	37	168	0	0	205	0	96	37	0	133	0	214	0	0	214	220	0	76	0	296	848
5:15 PM	23	163	0	0	186	0	119	25	0	144	0	185	0	0	185	234	0	91	0	325	840
Total Volume	112	658	0	0	770	0	375	119	0	494	0	772	0	0	772	869	0	346	0	1215	3251
% Approach Total	14.5	85.5	0.0	0.0		0.0	75.9	24.1	0.0		0.0	100.0	0.0	0.0		71.5	0.0	28.5	0.0		
PHF	0.757	0.979	0.000	0.000	0.939	0.000	0.788	0.804	0.000	0.858	0.000	0.902	0.000	0.000	0.902	0.928	0.000	0.901	0.000	0.935	0.958
Entering Leg	112	658	0	0	770	0	375	119	0	494	0	772	0	0	772	869	0	346	0	1215	3251
Exiting Leg	1118					0					1646					487					3251
Total	1888					494					2418					1702					6502

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Light Goods Vehicle**



	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	2	22	0	0	24	0	4	3	0	7	0	25	0	0	25	20	0	16	0	36	92
3:15 PM	3	19	0	0	22	0	7	2	0	9	0	25	0	0	25	14	0	14	0	28	84
3:30 PM	1	13	0	0	14	0	8	2	0	10	0	21	0	0	21	15	0	13	0	28	73
3:45 PM	3	9	0	0	12	0	4	0	0	4	0	31	0	0	31	10	0	13	0	23	70
Total	9	63	0	0	72	0	23	7	0	30	0	102	0	0	102	59	0	56	0	115	319
4:00 PM	1	17	0	0	18	0	12	0	0	12	0	28	0	0	28	10	0	19	0	29	87
4:15 PM	1	7	0	0	8	1	7	1	0	9	0	28	0	0	28	9	0	13	0	22	67
4:30 PM	1	16	0	0	17	0	9	5	0	14	0	13	0	0	13	7	0	9	0	16	60
4:45 PM	0	5	0	0	5	0	8	1	0	9	0	18	0	0	18	10	0	8	0	18	50
Total	3	45	0	0	48	1	36	7	0	44	0	87	0	0	87	36	0	49	0	85	264
5:00 PM	0	3	0	0	3	0	10	4	0	14	0	23	0	0	23	12	0	5	0	17	57
5:15 PM	4	12	0	0	16	0	8	3	0	11	0	19	0	0	19	10	0	6	0	16	62
5:30 PM	1	11	0	0	12	0	12	1	0	13	0	8	0	0	8	6	0	2	0	8	41
5:45 PM	1	12	0	0	13	0	6	2	0	8	0	11	0	0	11	10	0	4	0	14	46
Total	6	38	0	0	44	0	36	10	0	46	0	61	0	0	61	38	0	17	0	55	206
Grand Total	18	146	0	0	164	1	95	24	0	120	0	250	0	0	250	133	0	122	0	255	789
Approach %	11.0	89.0	0.0	0.0		0.8	79.2	20.0	0.0		0.0	100.0	0.0	0.0		52.2	0.0	47.8	0.0		
Total %	2.3	18.5	0.0	0.0	20.8	0.1	12.0	3.0	0.0	15.2	0.0	31.7	0.0	0.0	31.7	16.9	0.0	15.5	0.0	32.3	
Exiting Leg Total	373					0					303					113					789

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	2	22	0	0	24	0	4	3	0	7	0	25	0	0	25	20	0	16	0	36	92
3:15 PM	3	19	0	0	22	0	7	2	0	9	0	25	0	0	25	14	0	14	0	28	84
3:30 PM	1	13	0	0	14	0	8	2	0	10	0	21	0	0	21	15	0	13	0	28	73
3:45 PM	3	9	0	0	12	0	4	0	0	4	0	31	0	0	31	10	0	13	0	23	70
Total Volume	9	63	0	0	72	0	23	7	0	30	0	102	0	0	102	59	0	56	0	115	319
% Approach Total	12.5	87.5	0.0	0.0		0.0	76.7	23.3	0.0		0.0	100.0	0.0	0.0		51.3	0.0	48.7	0.0		
PHF	0.750	0.716	0.000	0.000	0.750	0.000	0.719	0.583	0.000	0.750	0.000	0.823	0.000	0.000	0.823	0.738	0.000	0.875	0.000	0.799	0.867
Entering Leg	9	63	0	0	72	0	23	7	0	30	0	102	0	0	102	59	0	56	0	115	319
Exiting Leg	158					0					129					32					319
Total	230					30					231					147					638

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
3:00 PM	1	0	0	0	1	0	3	0	0	3	0	1	0	0	1	1	0	0	0	0	1	6
3:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
3:30 PM	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	0	3
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
Total	1	1	0	0	2	0	4	0	0	4	0	5	0	0	5	1	0	0	0	0	1	12
4:00 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2	0	0	0	0	2	4
4:45 PM	1	1	0	0	2	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	4
Total	1	3	0	0	4	0	1	0	0	1	0	3	0	0	3	3	0	0	0	0	3	11
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
5:15 PM	0	1	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	3
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	1	2
Total	0	1	0	0	1	0	2	0	0	2	0	2	0	0	2	1	0	0	0	0	1	6
Grand Total	2	5	0	0	7	0	7	0	0	7	0	10	0	0	10	5	0	0	0	0	5	29
Approach %	28.6	71.4	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		100.0	0.0	0.0	0.0			
Total %	6.9	17.2	0.0	0.0	24.1	0.0	24.1	0.0	0.0	24.1	0.0	34.5	0.0	0.0	34.5	17.2	0.0	0.0	0.0	0.0	17.2	
Exiting Leg Total	10					0					10					9					29	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
3:00 PM	1	0	0	0	1	0	3	0	0	3	0	1	0	0	1	1	0	0	0	0	1	6
3:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
3:30 PM	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	0	3
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
Total Volume	1	1	0	0	2	0	4	0	0	4	0	5	0	0	5	1	0	0	0	0	1	12
% Approach Total	50.0	50.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		100.0	0.0	0.0	0.0			
PHF	0.250	0.250	0.000	0.000	0.500	0.000	0.333	0.000	0.000	0.333	0.000	0.625	0.000	0.000	0.625	0.250	0.000	0.000	0.000	0.250	0.500	
Entering Leg	1	1	0	0	2	0	4	0	0	4	0	5	0	0	5	1	0	0	0	0	1	12
Exiting Leg	5					0					2					5					12	
Total	7					4					7					6					24	

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
3:00 PM	0	3	0	0	3	0	3	0	0	3	0	0	0	0	0	4	0	0	0	0	4	10
3:15 PM	0	0	0	0	0	0	3	0	0	3	0	6	0	0	6	0	0	0	0	0	0	9
3:30 PM	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	2	0	0	0	0	2	7
3:45 PM	2	2	0	0	4	0	2	0	0	2	0	4	0	0	4	0	0	0	0	0	0	10
Total	2	6	0	0	8	0	8	0	0	8	0	14	0	0	14	6	0	0	0	0	6	36
4:00 PM	0	2	0	0	2	0	6	1	0	7	0	3	0	0	3	2	0	0	0	0	2	14
4:15 PM	0	3	0	0	3	0	2	0	0	2	0	4	0	0	4	2	0	2	0	0	4	13
4:30 PM	0	1	0	0	1	0	3	0	0	3	0	2	0	0	2	1	0	1	0	0	2	8
4:45 PM	0	0	0	0	0	0	1	1	0	2	0	2	0	0	2	2	0	0	0	0	2	6
Total	0	6	0	0	6	0	12	2	0	14	0	11	0	0	11	7	0	3	0	0	10	41
5:00 PM	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	7
5:15 PM	1	2	0	0	3	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	5
5:30 PM	0	0	0	0	0	0	4	3	0	7	0	2	0	0	2	2	0	0	0	0	2	11
5:45 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	1	0	0	0	0	1	3
Total	1	6	0	0	7	0	6	3	0	9	0	6	0	0	6	4	0	0	0	0	4	26
Grand Total	3	18	0	0	21	0	26	5	0	31	0	31	0	0	31	17	0	3	0	0	20	103
Approach %	14.3	85.7	0.0	0.0		0.0	83.9	16.1	0.0		0.0	100.0	0.0	0.0		85.0	0.0	15.0	0.0			
Total %	2.9	17.5	0.0	0.0	20.4	0.0	25.2	4.9	0.0	30.1	0.0	30.1	0.0	0.0	30.1	16.5	0.0	2.9	0.0	19.4		
Exiting Leg Total	34					0					40					29					103	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:45 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:45 PM	2	2	0	0	4	0	2	0	0	2	0	4	0	0	4	0	0	0	0	0	10
4:00 PM	0	2	0	0	2	0	6	1	0	7	0	3	0	0	3	2	0	0	0	0	14
4:15 PM	0	3	0	0	3	0	2	0	0	2	0	4	0	0	4	2	0	2	0	4	13
4:30 PM	0	1	0	0	1	0	3	0	0	3	0	2	0	0	2	1	0	1	0	2	8
Total Volume	2	8	0	0	10	0	13	1	0	14	0	13	0	0	13	5	0	3	0	8	45
% Approach Total	20.0	80.0	0.0	0.0		0.0	92.9	7.1	0.0		0.0	100.0	0.0	0.0		62.5	0.0	37.5	0.0		
PHF	0.250	0.667	0.000	0.000	0.625	0.000	0.542	0.250	0.000	0.500	0.000	0.813	0.000	0.000	0.813	0.625	0.000	0.375	0.000	0.500	0.804
Entering Leg	2	8	0	0	10	0	13	1	0	14	0	13	0	0	13	5	0	3	0	8	45
Exiting Leg	16					0					14					15					45
Total	26					14					27					23					90

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
3:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	2	4
3:15 PM	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	1	0	0	0	0	1	3
3:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Total	0	1	0	0	1	0	2	0	0	2	0	2	0	0	2	3	0	1	0	4	9	
4:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	3	
4:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	2	0	3	5	
4:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	1	3	0	0	4	0	1	0	0	1	0	1	0	0	1	1	0	4	0	5	11	
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	
5:15 PM	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	4	
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	
Total	0	2	0	0	2	0	2	0	0	2	0	2	0	0	2	1	0	0	0	1	7	
Grand Total	1	6	0	0	7	0	5	0	0	5	0	5	0	0	5	5	0	5	0	10	27	
Approach %	14.3	85.7	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		50.0	0.0	50.0	0.0			
Total %	3.7	22.2	0.0	0.0	25.9	0.0	18.5	0.0	0.0	18.5	0.0	18.5	0.0	0.0	18.5	18.5	0.0	18.5	0.0	37.0		
Exiting Leg Total	10					0					11					6					27	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:00 PM	Bedford Street (Route 4/225)					Jug Handle					Bedford Street (Route 4/225)					Hartwell Avenue					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	3
4:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	2	0	3	5
4:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	1	3	0	0	4	0	1	0	0	1	0	1	0	0	1	1	0	4	0	5	11
% Approach Total	25.0	75.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		20.0	0.0	80.0	0.0		
PHF	0.250	0.750	0.000	0.000	0.500	0.000	0.250	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.250	0.250	0.000	0.500	0.000	0.417	0.550
Entering Leg	1	3	0	0	4	0	1	0	0	1	0	1	0	0	1	1	0	4	0	5	11
Exiting Leg	5					0					4					2					11
Total	9					1					5					7					22

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	0							1							0							0							1

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.250		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Exiting Leg	0							1							0							0							1
Total	0							2							0							0							2

PDI File #: **176038 A**
 Location: **N: Bedford Street (Route 4/225) S: Bedford Street (Route 4/225)**
 Location: **E: Jug Handle W: Hartwell Avenue**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue							
	from North							from East							from South							from West							Total
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
Grand Total	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	2	0	2	4
Approach %	0	0	0	0	0	0	0	0	0	0	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	50	50	50	0	0	0	0	0	0	0	0	0	0	50	0	50	50	50
Exiting Leg Total	0							2							0							2							4

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Bedford Street (Route 4/225)							Jug Handle							Bedford Street (Route 4/225)							Hartwell Avenue							
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2	3
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0			
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.250		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500		0.750
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	0	2	3	
Exiting Leg														1													2	3	
Total							0						2														4	6	

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	1	2	16	0	19	33	90	10	1	134	0	0	0	0	0	0	45	2	0	47	200
6:15 AM	5	0	16	0	21	50	126	8	0	184	1	0	0	0	1	1	66	13	0	80	286
6:30 AM	13	2	32	0	47	53	126	12	0	191	1	0	0	0	1	3	104	18	0	125	364
6:45 AM	11	3	43	0	57	58	131	16	0	205	1	0	0	0	1	1	146	31	0	178	441
Total	30	7	107	0	144	194	473	46	1	714	3	0	0	0	3	5	361	64	0	430	1291
7:00 AM	16	4	54	0	74	73	111	26	0	210	5	2	2	0	9	0	150	26	0	176	469
7:15 AM	14	24	58	0	96	105	123	53	0	281	17	8	0	0	25	1	156	34	0	191	593
7:30 AM	18	23	70	0	111	84	163	54	0	301	34	8	8	0	50	4	174	32	0	210	672
7:45 AM	25	11	109	0	145	80	136	37	0	253	23	3	4	0	30	5	174	37	0	216	644
Total	73	62	291	0	426	342	533	170	0	1045	79	21	14	0	114	10	654	129	0	793	2378
8:00 AM	24	8	98	0	130	94	113	26	0	233	11	3	2	0	16	3	144	37	0	184	563
8:15 AM	10	7	83	0	100	122	109	18	0	249	6	5	2	0	13	1	200	24	0	225	587
8:30 AM	30	4	92	0	126	95	115	15	0	225	4	1	1	0	6	2	184	31	0	217	574
8:45 AM	30	9	81	0	120	96	119	28	0	243	8	2	1	0	11	4	210	37	0	251	625
Total	94	28	354	0	476	407	456	87	0	950	29	11	6	0	46	10	738	129	0	877	2349
Grand Total	197	97	752	0	1046	943	1462	303	1	2709	111	32	20	0	163	25	1753	322	0	2100	6018
Approach %	18.8	9.3	71.9	0.0		34.8	54.0	11.2	0.0		68.1	19.6	12.3	0.0		1.2	83.5	15.3	0.0		
Total %	3.3	1.6	12.5	0.0	17.4	15.7	24.3	5.0	0.0	45.0	1.8	0.5	0.3	0.0	2.7	0.4	29.1	5.4	0.0	34.9	
Exiting Leg Total	1297					2617					425					1679					6018
Cars	191	92	734	0	1017	922	1396	292	1	2611	97	28	19	0	144	24	1706	318	0	2048	5820
% Cars	97.0	94.8	97.6	0.0	97.2	97.8	95.5	96.4	100.0	96.4	87.4	87.5	95.0	0.0	88.3	96.0	97.3	98.8	0.0	97.5	96.7
Exiting Leg Total	1268					2538					408					1606					5820
Heavy Vehicles	6	5	18	0	29	21	66	11	0	98	14	4	1	0	19	1	47	4	0	52	198
% Heavy Vehicles	3.0	5.2	2.4	0.0	2.8	2.2	4.5	3.6	0.0	3.6	12.6	12.5	5.0	0.0	11.7	4.0	2.7	1.2	0.0	2.5	3.3
Exiting Leg Total	29					79					17					73					198

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:15 AM	14	24	58	0	96	105	123	53	0	281	17	8	0	0	25	1	156	34	0	191	593
7:30 AM	18	23	70	0	111	84	163	54	0	301	34	8	8	0	50	4	174	32	0	210	672
7:45 AM	25	11	109	0	145	80	136	37	0	253	23	3	4	0	30	5	174	37	0	216	644
8:00 AM	24	8	98	0	130	94	113	26	0	233	11	3	2	0	16	3	144	37	0	184	563
Total Volume	81	66	335	0	482	363	535	170	0	1068	85	22	14	0	121	13	648	140	0	801	2472
% Approach Total	16.8	13.7	69.5	0.0		34.0	50.1	15.9	0.0		70.2	18.2	11.6	0.0		1.6	80.9	17.5	0.0		
PHF	0.810	0.688	0.768	0.000	0.831	0.864	0.821	0.787	0.000	0.887	0.625	0.688	0.438	0.000	0.605	0.650	0.931	0.946	0.000	0.927	0.920
Cars	77	62	325	0	464	356	512	163	0	1031	72	19	14	0	105	13	628	139	0	780	2380
Cars %	95.1	93.9	97.0	0.0	96.3	98.1	95.7	95.9	0.0	96.5	84.7	86.4	100.0	0.0	86.8	100.0	96.9	99.3	0.0	97.4	96.3
Heavy Vehicles	4	4	10	0	18	7	23	7	0	37	13	3	0	0	16	0	20	1	0	21	92
Heavy Vehicles %	4.9	6.1	3.0	0.0	3.7	1.9	4.3	4.1	0.0	3.5	15.3	13.6	0.0	0.0	13.2	0.0	3.1	0.7	0.0	2.6	3.7
Cars Enter Leg	77	62	325	0	464	356	512	163	0	1031	72	19	14	0	105	13	628	139	0	780	2380
Heavy Enter Leg	4	4	10	0	18	7	23	7	0	37	13	3	0	0	16	0	20	1	0	21	92
Total Entering Leg	81	66	335	0	482	363	535	170	0	1068	85	22	14	0	121	13	648	140	0	801	2472
Cars Exiting Leg	514					1025					238					603					2380
Heavy Exiting Leg	11					43					11					27					92
Total Exiting Leg	525					1068					249					630					2472

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Cars-Combined (Motorcycles, Cars, Light Goods)**



	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	1	2	16	0	19	33	83	10	1	127	0	0	0	0	0	0	42	2	0	44	190
6:15 AM	5	0	15	0	20	50	119	8	0	177	1	0	0	0	1	0	65	13	0	78	276
6:30 AM	13	2	32	0	47	51	121	11	0	183	1	0	0	0	1	3	99	18	0	120	351
6:45 AM	11	3	42	0	56	54	127	16	0	197	1	0	0	0	1	1	140	31	0	172	426
Total	30	7	105	0	142	188	450	45	1	684	3	0	0	0	3	4	346	64	0	414	1243
7:00 AM	16	3	53	0	72	72	107	26	0	205	4	2	1	0	7	0	147	25	0	172	456
7:15 AM	12	22	56	0	90	103	118	48	0	269	13	6	0	0	19	1	150	34	0	185	563
7:30 AM	17	22	67	0	106	83	155	53	0	291	30	7	8	0	45	4	165	32	0	201	643
7:45 AM	24	11	108	0	143	78	132	36	0	246	18	3	4	0	25	5	171	37	0	213	627
Total	69	58	284	0	411	336	512	163	0	1011	65	18	13	0	96	10	633	128	0	771	2289
8:00 AM	24	7	94	0	125	92	107	26	0	225	11	3	2	0	16	3	142	36	0	181	547
8:15 AM	10	7	81	0	98	120	105	18	0	243	6	4	2	0	12	1	199	24	0	224	577
8:30 AM	28	4	90	0	122	93	109	15	0	217	4	1	1	0	6	2	180	31	0	213	558
8:45 AM	30	9	80	0	119	93	113	25	0	231	8	2	1	0	11	4	206	35	0	245	606
Total	92	27	345	0	464	398	434	84	0	916	29	10	6	0	45	10	727	126	0	863	2288
Grand Total	191	92	734	0	1017	922	1396	292	1	2611	97	28	19	0	144	24	1706	318	0	2048	5820
Approach %	18.8	9.0	72.2	0.0		35.3	53.5	11.2	0.0		67.4	19.4	13.2	0.0		1.2	83.3	15.5	0.0		
Total %	3.3	1.6	12.6	0.0	17.5	15.8	24.0	5.0	0.0	44.9	1.7	0.5	0.3	0.0	2.5	0.4	29.3	5.5	0.0	35.2	
Exiting Leg Total	1268					2538					408					1606					5820

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	17	22	67	0	106	83	155	53	0	291	30	7	8	0	45	4	165	32	0	201	643
7:45 AM	24	11	108	0	143	78	132	36	0	246	18	3	4	0	25	5	171	37	0	213	627
8:00 AM	24	7	94	0	125	92	107	26	0	225	11	3	2	0	16	3	142	36	0	181	547
8:15 AM	10	7	81	0	98	120	105	18	0	243	6	4	2	0	12	1	199	24	0	224	577
Total Volume	75	47	350	0	472	373	499	133	0	1005	65	17	16	0	98	13	677	129	0	819	2394
% Approach Total	15.9	10.0	74.2	0.0		37.1	49.7	13.2	0.0		66.3	17.3	16.3	0.0		1.6	82.7	15.8	0.0		
PHF	0.781	0.534	0.810	0.000	0.825	0.777	0.805	0.627	0.000	0.863	0.542	0.607	0.500	0.000	0.544	0.650	0.851	0.872	0.000	0.914	0.931
Entering Leg	75	47	350	0	472	373	499	133	0	1005	65	17	16	0	98	13	677	129	0	819	2394
Exiting Leg	519					1092					193					590					2394
Total	991					2097					291					1409					4788

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
6:00 AM	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	0	3	0	0	0	3	10
6:15 AM	0	0	1	0	1	0	7	0	0	7	0	0	0	0	0	1	1	0	0	0	2	10
6:30 AM	0	0	0	0	0	2	5	1	0	8	0	0	0	0	0	0	5	0	0	0	5	13
6:45 AM	0	0	1	0	1	4	4	0	0	8	0	0	0	0	0	0	6	0	0	0	6	15
Total	0	0	2	0	2	6	23	1	0	30	0	0	0	0	0	1	15	0	0	0	16	48
7:00 AM	0	1	1	0	2	1	4	0	0	5	1	0	1	0	2	0	3	1	0	0	4	13
7:15 AM	2	2	2	0	6	2	5	5	0	12	4	2	0	0	6	0	6	0	0	0	6	30
7:30 AM	1	1	3	0	5	1	8	1	0	10	4	1	0	0	5	0	9	0	0	0	9	29
7:45 AM	1	0	1	0	2	2	4	1	0	7	5	0	0	0	5	0	3	0	0	0	3	17
Total	4	4	7	0	15	6	21	7	0	34	14	3	1	0	18	0	21	1	0	0	22	89
8:00 AM	0	1	4	0	5	2	6	0	0	8	0	0	0	0	0	0	2	1	0	0	3	16
8:15 AM	0	0	2	0	2	2	4	0	0	6	0	1	0	0	1	0	1	0	0	0	1	10
8:30 AM	2	0	2	0	4	2	6	0	0	8	0	0	0	0	0	0	4	0	0	0	4	16
8:45 AM	0	0	1	0	1	3	6	3	0	12	0	0	0	0	0	0	4	2	0	0	6	19
Total	2	1	9	0	12	9	22	3	0	34	0	1	0	0	1	0	11	3	0	0	14	61
Grand Total	6	5	18	0	29	21	66	11	0	98	14	4	1	0	19	1	47	4	0	0	52	198
Approach %	20.7	17.2	62.1	0.0		21.4	67.3	11.2	0.0		73.7	21.1	5.3	0.0		1.9	90.4	7.7	0.0			
Total %	3.0	2.5	9.1	0.0	14.6	10.6	33.3	5.6	0.0	49.5	7.1	2.0	0.5	0.0	9.6	0.5	23.7	2.0	0.0	26.3		
Exiting Leg Total	29					79					17					73					198	
Buses	1	5	8	0	14	12	9	7	0	28	13	4	0	0	17	0	8	0	0	0	8	67
% Buses	16.7	100.0	44.4	0.0	48.3	57.1	13.6	63.6	0.0	28.6	92.9	100.0	0.0	0.0	89.5	0.0	17.0	0.0	0.0	15.4	33.8	
Exiting Leg Total	16					29					12					10					67	
Single-Unit Trucks	4	0	8	0	12	8	51	4	0	63	0	0	1	0	1	1	32	3	0	0	36	112
% Single-Unit	66.7	0.0	44.4	0.0	41.4	38.1	77.3	36.4	0.0	64.3	0.0	0.0	100.0	0.0	5.3	100.0	68.1	75.0	0.0	0.0	69.2	56.6
Exiting Leg Total	11					40					5					56					112	
Articulated Trucks	1	0	2	0	3	1	6	0	0	7	1	0	0	0	1	0	7	1	0	0	8	19
% Articulated	16.7	0.0	11.1	0.0	10.3	4.8	9.1	0.0	0.0	7.1	7.1	0.0	0.0	0.0	5.3	0.0	14.9	25.0	0.0	0.0	15.4	9.6
Exiting Leg Total	2					10					0					7					19	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:15 AM	2	2	2	0	6	2	5	5	0	12	4	2	0	0	6	0	6	0	0	6	30
7:30 AM	1	1	3	0	5	1	8	1	0	10	4	1	0	0	5	0	9	0	0	9	29
7:45 AM	1	0	1	0	2	2	4	1	0	7	5	0	0	0	5	0	3	0	0	3	17
8:00 AM	0	1	4	0	5	2	6	0	0	8	0	0	0	0	0	0	2	1	0	3	16
Total Volume	4	4	10	0	18	7	23	7	0	37	13	3	0	0	16	0	20	1	0	21	92
% Approach Total	22.2	22.2	55.6	0.0		18.9	62.2	18.9	0.0		81.3	18.8	0.0	0.0		0.0	95.2	4.8	0.0		
PHF	0.500	0.500	0.625	0.000	0.750	0.875	0.719	0.350	0.000	0.771	0.650	0.375	0.000	0.000	0.667	0.000	0.556	0.250	0.000	0.583	0.767
Buses	1	4	3	0	8	4	2	7	0	13	12	3	0	0	15	0	2	0	0	2	38
Buses %	25.0	100.0	30.0	0.0	44.4	57.1	8.7	100.0	0.0	35.1	92.3	100.0	0.0	0.0	93.8	0.0	10.0	0.0	0.0	9.5	41.3
Single-Unit Trucks	2	0	5	0	7	3	19	0	0	22	0	0	0	0	0	0	14	1	0	15	44
Single-Unit %	50.0	0.0	50.0	0.0	38.9	42.9	82.6	0.0	0.0	59.5	0.0	0.0	0.0	0.0	0.0	0.0	70.0	100.0	0.0	71.4	47.8
Articulated Trucks	1	0	2	0	3	0	2	0	0	2	1	0	0	0	1	0	4	0	0	4	10
Articulated %	25.0	0.0	20.0	0.0	16.7	0.0	8.7	0.0	0.0	5.4	7.7	0.0	0.0	0.0	6.3	0.0	20.0	0.0	0.0	19.0	10.9
Buses	1	4	3	0	8	4	2	7	0	13	12	3	0	0	15	0	2	0	0	2	38
Single-Unit Trucks	2	0	5	0	7	3	19	0	0	22	0	0	0	0	0	0	14	1	0	15	44
Articulated Trucks	1	0	2	0	3	0	2	0	0	2	1	0	0	0	1	0	4	0	0	4	10
Total Entering Leg	4	4	10	0	18	7	23	7	0	37	13	3	0	0	16	0	20	1	0	21	92
Buses	7					17					11					3					38
Single-Unit Trucks	4					19					0					21					44
Articulated Trucks	0					7					0					3					10
Total Exiting Leg	11					43					11					27					92

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	1	2	12	0	15	27	57	7	1	92	0	0	0	0	0	0	38	2	0	40	147
6:15 AM	4	0	13	0	17	44	88	6	0	138	1	0	0	0	1	0	49	10	0	59	215
6:30 AM	12	2	31	0	45	45	98	8	0	151	0	0	0	0	0	2	82	16	0	100	296
6:45 AM	6	3	38	0	47	48	103	13	0	164	0	0	0	0	0	1	118	27	0	146	357
Total	23	7	94	0	124	164	346	34	1	545	1	0	0	0	1	3	287	55	0	345	1015
7:00 AM	14	3	47	0	64	69	91	22	0	182	4	1	1	0	6	0	126	19	0	145	397
7:15 AM	10	19	51	0	80	99	94	48	0	241	12	6	0	0	18	1	138	30	0	169	508
7:30 AM	17	17	63	0	97	79	132	51	0	262	27	6	7	0	40	4	144	28	0	176	575
7:45 AM	23	10	99	0	132	76	115	32	0	223	17	3	3	0	23	5	162	35	0	202	580
Total	64	49	260	0	373	323	432	153	0	908	60	16	11	0	87	10	570	112	0	692	2060
8:00 AM	23	7	90	0	120	92	95	26	0	213	11	3	1	0	15	3	133	35	0	171	519
8:15 AM	9	6	73	0	88	112	90	16	0	218	6	2	1	0	9	1	185	22	0	208	523
8:30 AM	24	4	84	0	112	92	99	15	0	206	4	1	1	0	6	2	162	26	0	190	514
8:45 AM	27	9	78	0	114	91	104	22	0	217	8	2	1	0	11	4	193	32	0	229	571
Total	83	26	325	0	434	387	388	79	0	854	29	8	4	0	41	10	673	115	0	798	2127
Grand Total	170	82	679	0	931	874	1166	266	1	2307	90	24	15	0	129	23	1530	282	0	1835	5202
Approach %	18.3	8.8	72.9	0.0		37.9	50.5	11.5	0.0		69.8	18.6	11.6	0.0		1.3	83.4	15.4	0.0		
Total %	3.3	1.6	13.1	0.0	17.9	16.8	22.4	5.1	0.0	44.3	1.7	0.5	0.3	0.0	2.5	0.4	29.4	5.4	0.0	35.3	
Exiting Leg Total	1180					2300					371					1351					5202

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	17	17	63	0	97	79	132	51	0	262	27	6	7	0	40	4	144	28	0	176	575
7:45 AM	23	10	99	0	132	76	115	32	0	223	17	3	3	0	23	5	162	35	0	202	580
8:00 AM	23	7	90	0	120	92	95	26	0	213	11	3	1	0	15	3	133	35	0	171	519
8:15 AM	9	6	73	0	88	112	90	16	0	218	6	2	1	0	9	1	185	22	0	208	523
Total Volume	72	40	325	0	437	359	432	125	0	916	61	14	12	0	87	13	624	120	0	757	2197
% Approach Total	16.5	9.2	74.4	0.0		39.2	47.2	13.6	0.0		70.1	16.1	13.8	0.0		1.7	82.4	15.9	0.0		
PHF	0.783	0.588	0.821	0.000	0.828	0.801	0.818	0.613	0.000	0.874	0.565	0.583	0.429	0.000	0.544	0.650	0.843	0.857	0.000	0.910	0.947
Entering Leg	72	40	325	0	437	359	432	125	0	916	61	14	12	0	87	13	624	120	0	757	2197
Exiting Leg	493					1010					178					516					2197
Total	930					1926					265					1273					4394

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Light Goods Vehicle**



	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
6:00 AM	0	0	4	0	4	6	26	3	0	35	0	0	0	0	0	0	4	0	0	0	4	43
6:15 AM	1	0	2	0	3	6	31	2	0	39	0	0	0	0	0	0	16	3	0	0	19	61
6:30 AM	1	0	1	0	2	6	23	3	0	32	1	0	0	0	0	1	17	2	0	0	20	55
6:45 AM	5	0	4	0	9	6	24	3	0	33	1	0	0	0	0	1	22	4	0	0	26	69
Total	7	0	11	0	18	24	104	11	0	139	2	0	0	0	0	2	59	9	0	0	69	228
7:00 AM	2	0	6	0	8	3	16	4	0	23	0	1	0	0	0	1	21	6	0	0	27	59
7:15 AM	2	3	5	0	10	4	24	0	0	28	1	0	0	0	0	1	12	4	0	0	16	55
7:30 AM	0	5	4	0	9	4	23	2	0	29	3	1	1	0	5	0	21	4	0	0	25	68
7:45 AM	1	1	9	0	11	2	17	4	0	23	1	0	1	0	2	0	9	2	0	0	11	47
Total	5	9	24	0	38	13	80	10	0	103	5	2	2	0	9	0	63	16	0	0	79	229
8:00 AM	1	0	4	0	5	0	12	0	0	12	0	0	1	0	1	0	9	1	0	0	10	28
8:15 AM	1	1	8	0	10	8	15	2	0	25	0	2	1	0	3	0	14	2	0	0	16	54
8:30 AM	4	0	6	0	10	1	10	0	0	11	0	0	0	0	0	0	18	5	0	0	23	44
8:45 AM	3	0	2	0	5	2	9	3	0	14	0	0	0	0	0	0	13	3	0	0	16	35
Total	9	1	20	0	30	11	46	5	0	62	0	2	2	0	4	0	54	11	0	0	65	161
Grand Total	21	10	55	0	86	48	230	26	0	304	7	4	4	0	15	1	176	36	0	0	213	618
Approach %	24.4	11.6	64.0	0.0		15.8	75.7	8.6	0.0		46.7	26.7	26.7	0.0		0.5	82.6	16.9	0.0			
Total %	3.4	1.6	8.9	0.0	13.9	7.8	37.2	4.2	0.0	49.2	1.1	0.6	0.6	0.0	2.4	0.2	28.5	5.8	0.0	34.5		
Exiting Leg Total	88					238					37					255					618	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:45 AM	5	0	4	0	9	6	24	3	0	33	1	0	0	0	1	0	22	4	0	26	69
7:00 AM	2	0	6	0	8	3	16	4	0	23	0	1	0	0	1	0	21	6	0	27	59
7:15 AM	2	3	5	0	10	4	24	0	0	28	1	0	0	0	1	0	12	4	0	16	55
7:30 AM	0	5	4	0	9	4	23	2	0	29	3	1	1	0	5	0	21	4	0	25	68
Total Volume	9	8	19	0	36	17	87	9	0	113	5	2	1	0	8	0	76	18	0	94	251
% Approach Total	25.0	22.2	52.8	0.0		15.0	77.0	8.0	0.0		62.5	25.0	12.5	0.0		0.0	80.9	19.1	0.0		
PHF	0.450	0.400	0.792	0.000	0.900	0.708	0.906	0.563	0.000	0.856	0.417	0.500	0.250	0.000	0.400	0.000	0.864	0.750	0.000	0.870	0.909
Entering Leg	9	8	19	0	36	17	87	9	0	113	5	2	1	0	8	0	76	18	0	94	251
Exiting Leg	37					100					17					97					251
Total	73					213					25					191					502

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
6:15 AM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	2	0	0	0	2
Total	0	0	2	0	2	2	2	0	0	4	0	0	0	0	0	0	3	0	0	0	3
7:00 AM	0	1	1	0	2	0	1	0	0	1	1	0	0	0	1	0	1	0	0	0	1
7:15 AM	1	2	0	0	3	1	0	5	0	6	4	2	0	0	6	0	0	0	0	0	0
7:30 AM	0	1	2	0	3	0	1	1	0	2	4	1	0	0	5	0	1	0	0	0	1
7:45 AM	0	0	0	0	0	2	0	1	0	3	4	0	0	0	4	0	1	0	0	0	1
Total	1	4	3	0	8	3	2	7	0	12	13	3	0	0	16	0	3	0	0	0	3
8:00 AM	0	1	1	0	2	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0
8:30 AM	0	0	1	0	1	2	3	0	0	5	0	0	0	0	0	0	1	0	0	0	1
8:45 AM	0	0	1	0	1	2	1	0	0	3	0	0	0	0	0	0	1	0	0	0	1
Total	0	1	3	0	4	7	5	0	0	12	0	1	0	0	1	0	2	0	0	0	2
Grand Total	1	5	8	0	14	12	9	7	0	28	13	4	0	0	17	0	8	0	0	0	8
Approach %	7.1	35.7	57.1	0.0		42.9	32.1	25.0	0.0		76.5	23.5	0.0	0.0		0.0	100.0	0.0	0.0		
Total %	1.5	7.5	11.9	0.0	20.9	17.9	13.4	10.4	0.0	41.8	19.4	6.0	0.0	0.0	25.4	0.0	11.9	0.0	0.0	11.9	
Exiting Leg Total	16					29					12					10					67

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:00 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:00 AM	0	1	1	0	2	0	1	0	0	1	1	0	0	0	1	0	1	0	0	1	5
7:15 AM	1	2	0	0	3	1	0	5	0	6	4	2	0	0	6	0	0	0	0	0	15
7:30 AM	0	1	2	0	3	0	1	1	0	2	4	1	0	0	5	0	1	0	0	1	11
7:45 AM	0	0	0	0	0	2	0	1	0	3	4	0	0	0	4	0	1	0	0	1	8
Total Volume	1	4	3	0	8	3	2	7	0	12	13	3	0	0	16	0	3	0	0	3	39
% Approach Total	12.5	50.0	37.5	0.0		25.0	16.7	58.3	0.0		81.3	18.8	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.250	0.500	0.375	0.000	0.667	0.375	0.500	0.350	0.000	0.500	0.813	0.375	0.000	0.000	0.667	0.000	0.750	0.000	0.000	0.750	0.650
Entering Leg	1	4	3	0	8	3	2	7	0	12	13	3	0	0	16	0	3	0	0	3	39
Exiting Leg					6					19					11					3	39
Total					14					31					27					6	78

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	2	0	0	2	7
6:15 AM	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	1	1	0	0	2	7
6:30 AM	0	0	0	0	0	0	3	1	0	4	0	0	0	0	0	0	5	0	0	5	9
6:45 AM	0	0	0	0	0	3	4	0	0	7	0	0	0	0	0	0	3	0	0	3	10
Total	0	0	0	0	0	3	17	1	0	21	0	0	0	0	0	1	11	0	0	12	33
7:00 AM	0	0	0	0	0	1	3	0	0	4	0	0	1	0	1	0	1	1	0	2	7
7:15 AM	0	0	1	0	1	1	4	0	0	5	0	0	0	0	0	0	5	0	0	5	11
7:30 AM	1	0	1	0	2	1	6	0	0	7	0	0	0	0	0	0	5	0	0	5	14
7:45 AM	1	0	1	0	2	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	8
Total	2	0	3	0	5	3	17	0	0	20	0	0	1	0	1	0	13	1	0	14	40
8:00 AM	0	0	2	0	2	1	5	0	0	6	0	0	0	0	0	0	2	1	0	3	11
8:15 AM	0	0	2	0	2	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	7
8:30 AM	2	0	1	0	3	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	9
8:45 AM	0	0	0	0	0	1	5	3	0	9	0	0	0	0	0	0	2	1	0	3	12
Total	2	0	5	0	7	2	17	3	0	22	0	0	0	0	0	0	8	2	0	10	39
Grand Total	4	0	8	0	12	8	51	4	0	63	0	0	1	0	1	1	32	3	0	36	112
Approach %	33.3	0.0	66.7	0.0		12.7	81.0	6.3	0.0		0.0	0.0	100.0	0.0		2.8	88.9	8.3	0.0		
Total %	3.6	0.0	7.1	0.0	10.7	7.1	45.5	3.6	0.0	56.3	0.0	0.0	0.9	0.0	0.9	0.9	28.6	2.7	0.0	32.1	
Exiting Leg Total	11					40					5					56					112

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:15 AM	0	0	1	0	1	1	4	0	0	5	0	0	0	0	0	0	5	0	0	5	11
7:30 AM	1	0	1	0	2	1	6	0	0	7	0	0	0	0	0	0	5	0	0	5	14
7:45 AM	1	0	1	0	2	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	8
8:00 AM	0	0	2	0	2	1	5	0	0	6	0	0	0	0	0	0	2	1	0	3	11
Total Volume	2	0	5	0	7	3	19	0	0	22	0	0	0	0	0	0	14	1	0	15	44
% Approach Total	28.6	0.0	71.4	0.0		13.6	86.4	0.0	0.0		0.0	0.0	0.0	0.0		0.0	93.3	6.7	0.0		
PHF	0.500	0.000	0.625	0.000	0.875	0.750	0.792	0.000	0.000	0.786	0.000	0.000	0.000	0.000	0.000	0.000	0.700	0.250	0.000	0.750	0.786
Entering Leg	2	0	5	0	7	3	19	0	0	22	0	0	0	0	0	0	14	1	0	15	44
Exiting Leg	4					19					0					21					44
Total	11					41					0					36					88

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
6:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	2
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	1	0	0	1	6
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
7:15 AM	1	0	1	0	2	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	4
7:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
7:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
Total	1	0	1	0	2	0	2	0	0	2	1	0	0	0	1	0	5	0	0	5	10
8:00 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2
Total	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	3
Grand Total	1	0	2	0	3	1	6	0	0	7	1	0	0	0	1	0	7	1	0	8	19
Approach %	33.3	0.0	66.7	0.0		14.3	85.7	0.0	0.0		100.0	0.0	0.0	0.0		0.0	87.5	12.5	0.0		
Total %	5.3	0.0	10.5	0.0	15.8	5.3	31.6	0.0	0.0	36.8	5.3	0.0	0.0	0.0	5.3	0.0	36.8	5.3	0.0	42.1	
Exiting Leg Total	2					10					0					7					19

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
7:15 AM	1	0	1	0	2	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	4
7:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	0	3	4
Total Volume	1	0	1	0	2	0	2	0	0	2	0	0	0	0	0	0	6	0	0	0	6	10
% Approach Total	50.0	0.0	50.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0			
PHF	0.250	0.000	0.250	0.000	0.250	0.000	0.500	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.500	0.625
Entering Leg	1	0	1	0	2	0	2	0	0	2	0	0	0	0	0	0	6	0	0	0	6	10
Exiting Leg	0					7					0					3					10	
Total	2					9					0					9					20	

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
8:30 AM	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
Grand Total	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	4
Approach %	50.0	0.0	50.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		
Total %	25.0	0.0	25.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	50.0		
Exiting Leg Total	0							3							0							1							4

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
8:30 AM	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total Volume	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3
% Approach Total	50.0	0.0	50.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		
PHF	0.250	0.000	0.250	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.750	
Entering Leg	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3	
Exiting Leg	0							2							0							1							3
Total	2							2							0							2							6

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turns	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0							0							0							0							0

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turns	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0							0							0							0							0
Total	0							0							0							0							0

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	39	10	89	0	138	36	155	11	0	202	38	6	4	0	48	1	109	21	0	131	519
3:15 PM	34	6	70	0	110	48	161	15	0	224	17	5	1	0	23	4	114	22	0	140	497
3:30 PM	45	8	62	0	115	50	169	12	0	231	48	20	5	0	73	0	97	25	0	122	541
3:45 PM	27	7	67	0	101	43	183	15	0	241	21	8	0	0	29	3	121	35	0	159	530
Total	145	31	288	0	464	177	668	53	0	898	124	39	10	0	173	8	441	103	0	552	2087
4:00 PM	34	1	82	0	117	50	172	11	0	233	19	12	4	0	35	0	83	28	0	111	496
4:15 PM	28	3	93	0	124	59	189	4	0	252	20	2	7	0	29	0	107	27	0	134	539
4:30 PM	27	3	101	0	131	45	191	7	0	243	19	3	5	0	27	1	94	20	0	115	516
4:45 PM	39	3	86	0	128	40	220	15	0	275	21	4	7	0	32	0	74	27	0	101	536
Total	128	10	362	0	500	194	772	37	0	1003	79	21	23	0	123	1	358	102	0	461	2087
5:00 PM	32	6	101	0	139	32	188	10	0	230	21	8	4	0	33	1	102	33	0	136	538
5:15 PM	32	4	89	0	125	39	190	5	0	234	29	14	3	0	46	2	77	30	0	109	514
5:30 PM	38	1	94	0	133	35	218	9	0	262	16	7	5	0	28	1	90	29	0	120	543
5:45 PM	29	3	103	0	135	37	177	6	0	220	23	1	3	0	27	1	76	24	0	101	483
Total	131	14	387	0	532	143	773	30	0	946	89	30	15	0	134	5	345	116	0	466	2078
Grand Total	404	55	1037	0	1496	514	2213	120	0	2847	292	90	48	0	430	14	1144	321	0	1479	6252
Approach %	27.0	3.7	69.3	0.0		18.1	77.7	4.2	0.0		67.9	20.9	11.2	0.0		0.9	77.3	21.7	0.0		
Total %	6.5	0.9	16.6	0.0	23.9	8.2	35.4	1.9	0.0	45.5	4.7	1.4	0.8	0.0	6.9	0.2	18.3	5.1	0.0	23.7	
Exiting Leg Total	925					2473					189					2665					6252
Cars	401	51	1025	0	1477	491	2178	117	0	2786	287	87	48	0	422	14	1115	310	0	1439	6124
% Cars	99.3	92.7	98.8	0.0	98.7	95.5	98.4	97.5	0.0	97.9	98.3	96.7	100.0	0.0	98.1	100.0	97.5	96.6	0.0	97.3	98.0
Exiting Leg Total	888					2427					182					2627					6124
Heavy Vehicles	3	4	12	0	19	23	35	3	0	61	5	3	0	0	8	0	29	11	0	40	128
% Heavy Vehicles	0.7	7.3	1.2	0.0	1.3	4.5	1.6	2.5	0.0	2.1	1.7	3.3	0.0	0.0	1.9	0.0	2.5	3.4	0.0	2.7	2.0
Exiting Leg Total	37					46					7					38					128

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:45 PM	39	3	86	0	128	40	220	15	0	275	21	4	7	0	32	0	74	27	0	101	536
5:00 PM	32	6	101	0	139	32	188	10	0	230	21	8	4	0	33	1	102	33	0	136	538
5:15 PM	32	4	89	0	125	39	190	5	0	234	29	14	3	0	46	2	77	30	0	109	514
5:30 PM	38	1	94	0	133	35	218	9	0	262	16	7	5	0	28	1	90	29	0	120	543
Total Volume	141	14	370	0	525	146	816	39	0	1001	87	33	19	0	139	4	343	119	0	466	2131
% Approach Total	26.9	2.7	70.5	0.0		14.6	81.5	3.9	0.0		62.6	23.7	13.7	0.0		0.9	73.6	25.5	0.0		
PHF	0.904	0.583	0.916	0.000	0.944	0.913	0.927	0.650	0.000	0.910	0.750	0.589	0.679	0.000	0.755	0.500	0.841	0.902	0.000	0.857	0.981
Cars	141	12	367	0	520	143	808	38	0	989	86	31	19	0	136	4	332	116	0	452	2097
Cars %	100.0	85.7	99.2	0.0	99.0	97.9	99.0	97.4	0.0	98.8	98.9	93.9	100.0	0.0	97.8	100.0	96.8	97.5	0.0	97.0	98.4
Heavy Vehicles	0	2	3	0	5	3	8	1	0	12	1	2	0	0	3	0	11	3	0	14	34
Heavy Vehicles %	0.0	14.3	0.8	0.0	1.0	2.1	1.0	2.6	0.0	1.2	1.1	6.1	0.0	0.0	2.2	0.0	3.2	2.5	0.0	3.0	1.6
Cars Enter Leg	141	12	367	0	520	143	808	38	0	989	86	31	19	0	136	4	332	116	0	452	2097
Heavy Enter Leg	0	2	3	0	5	3	8	1	0	12	1	2	0	0	3	0	11	3	0	14	34
Total Entering Leg	141	14	370	0	525	146	816	39	0	1001	87	33	19	0	139	4	343	119	0	466	2131
Cars Exiting Leg	290					785					54					968					2097
Heavy Exiting Leg	8					15					3					8					34
Total Exiting Leg	298					800					57					976					2131

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



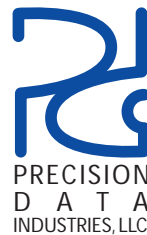
Cars-Combined (Motorcycles, Cars, Light Goods)

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	38	10	87	0	135	36	150	11	0	197	37	6	4	0	47	1	105	20	0	126	505
3:15 PM	33	6	69	0	108	46	156	14	0	216	17	5	1	0	23	4	109	21	0	134	481
3:30 PM	45	8	61	0	114	48	164	11	0	223	47	19	5	0	71	0	94	25	0	119	527
3:45 PM	26	7	67	0	100	41	179	15	0	235	21	8	0	0	29	3	120	35	0	158	522
Total	142	31	284	0	457	171	649	51	0	871	122	38	10	0	170	8	428	101	0	537	2035
4:00 PM	34	1	81	0	116	44	168	11	0	223	18	12	4	0	34	0	83	27	0	110	483
4:15 PM	28	2	90	0	120	55	188	4	0	247	19	2	7	0	28	0	106	24	0	130	525
4:30 PM	27	3	100	0	130	44	189	7	0	240	19	3	5	0	27	1	91	18	0	110	507
4:45 PM	39	3	86	0	128	39	217	15	0	271	21	4	7	0	32	0	72	27	0	99	530
Total	128	9	357	0	494	182	762	37	0	981	77	21	23	0	121	1	352	96	0	449	2045
5:00 PM	32	6	100	0	138	31	186	9	0	226	21	8	4	0	33	1	96	32	0	129	526
5:15 PM	32	2	88	0	122	38	188	5	0	231	29	13	3	0	45	2	77	28	0	107	505
5:30 PM	38	1	93	0	132	35	217	9	0	261	15	6	5	0	26	1	87	29	0	117	536
5:45 PM	29	2	103	0	134	34	176	6	0	216	23	1	3	0	27	1	75	24	0	100	477
Total	131	11	384	0	526	138	767	29	0	934	88	28	15	0	131	5	335	113	0	453	2044
Grand Total	401	51	1025	0	1477	491	2178	117	0	2786	287	87	48	0	422	14	1115	310	0	1439	6124
Approach %	27.1	3.5	69.4	0.0		17.6	78.2	4.2	0.0		68.0	20.6	11.4	0.0		1.0	77.5	21.5	0.0		
Total %	6.5	0.8	16.7	0.0	24.1	8.0	35.6	1.9	0.0	45.5	4.7	1.4	0.8	0.0	6.9	0.2	18.2	5.1	0.0	23.5	
Exiting Leg Total	888					2427					182					2627					6124

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:45 PM	39	3	86	0	128	39	217	15	0	271	21	4	7	0	32	0	72	27	0	99	530
5:00 PM	32	6	100	0	138	31	186	9	0	226	21	8	4	0	33	1	96	32	0	129	526
5:15 PM	32	2	88	0	122	38	188	5	0	231	29	13	3	0	45	2	77	28	0	107	505
5:30 PM	38	1	93	0	132	35	217	9	0	261	15	6	5	0	26	1	87	29	0	117	536
Total Volume	141	12	367	0	520	143	808	38	0	989	86	31	19	0	136	4	332	116	0	452	2097
% Approach Total	27.1	2.3	70.6	0.0		14.5	81.7	3.8	0.0		63.2	22.8	14.0	0.0		0.9	73.5	25.7	0.0		
PHF	0.904	0.500	0.918	0.000	0.942	0.917	0.931	0.633	0.000	0.912	0.741	0.596	0.679	0.000	0.756	0.500	0.865	0.906	0.000	0.876	0.978
Entering Leg	141	12	367	0	520	143	808	38	0	989	86	31	19	0	136	4	332	116	0	452	2097
Exiting Leg	290					785					54					968					2097
Total	810					1774					190					1420					4194

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



46 Morton Street, Framingham, MA 01702
 Office: 508-875-0100 Fax: 508-875-0118
 Email: datarequests@pdillc.com

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	1	0	2	0	3	0	5	0	0	5	1	0	0	0	1	0	4	1	0	5	14
3:15 PM	1	0	1	0	2	2	5	1	0	8	0	0	0	0	0	0	5	1	0	6	16
3:30 PM	0	0	1	0	1	2	5	1	0	8	1	1	0	0	2	0	3	0	0	3	14
3:45 PM	1	0	0	0	1	2	4	0	0	6	0	0	0	0	0	0	1	0	0	1	8
Total	3	0	4	0	7	6	19	2	0	27	2	1	0	0	3	0	13	2	0	15	52
4:00 PM	0	0	1	0	1	6	4	0	0	10	1	0	0	0	1	0	0	1	0	1	13
4:15 PM	0	1	3	0	4	4	1	0	0	5	1	0	0	0	1	0	1	3	0	4	14
4:30 PM	0	0	1	0	1	1	2	0	0	3	0	0	0	0	0	0	3	2	0	5	9
4:45 PM	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	0	2	0	0	2	6
Total	0	1	5	0	6	12	10	0	0	22	2	0	0	0	2	0	6	6	0	12	42
5:00 PM	0	0	1	0	1	1	2	1	0	4	0	0	0	0	0	0	6	1	0	7	12
5:15 PM	0	2	1	0	3	1	2	0	0	3	0	1	0	0	1	0	0	2	0	2	9
5:30 PM	0	0	1	0	1	0	1	0	0	1	1	1	0	0	2	0	3	0	0	3	7
5:45 PM	0	1	0	0	1	3	1	0	0	4	0	0	0	0	0	0	1	0	0	1	6
Total	0	3	3	0	6	5	6	1	0	12	1	2	0	0	3	0	10	3	0	13	34
Grand Total	3	4	12	0	19	23	35	3	0	61	5	3	0	0	8	0	29	11	0	40	128
Approach %	15.8	21.1	63.2	0.0		37.7	57.4	4.9	0.0		62.5	37.5	0.0	0.0		0.0	72.5	27.5	0.0		
Total %	2.3	3.1	9.4	0.0	14.8	18.0	27.3	2.3	0.0	47.7	3.9	2.3	0.0	0.0	6.3	0.0	22.7	8.6	0.0	31.3	
Exiting Leg Total	37					46					7					38					128
Buses	1	1	10	0	12	12	7	1	0	20	1	1	0	0	2	0	8	8	0	16	50
% Buses	33.3	25.0	83.3	0.0	63.2	52.2	20.0	33.3	0.0	32.8	20.0	33.3	0.0	0.0	25.0	0.0	27.6	72.7	0.0	40.0	39.1
Exiting Leg Total	21					19					2					8					50
Single-Unit Trucks	2	3	1	0	6	8	23	2	0	33	4	2	0	0	6	0	19	2	0	21	66
% Single-Unit	66.7	75.0	8.3	0.0	31.6	34.8	65.7	66.7	0.0	54.1	80.0	66.7	0.0	0.0	75.0	0.0	65.5	18.2	0.0	52.5	51.6
Exiting Leg Total	12					24					5					25					66
Articulated Trucks	0	0	1	0	1	3	5	0	0	8	0	0	0	0	0	0	2	1	0	3	12
% Articulated	0.0	0.0	8.3	0.0	5.3	13.0	14.3	0.0	0.0	13.1	0.0	0.0	0.0	0.0	0.0	0.0	6.9	9.1	0.0	7.5	9.4
Exiting Leg Total	4					3					0					5					12

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	1	0	2	0	3	0	5	0	0	5	1	0	0	0	1	0	4	1	0	5	14
3:15 PM	1	0	1	0	2	2	5	1	0	8	0	0	0	0	0	0	5	1	0	6	16
3:30 PM	0	0	1	0	1	2	5	1	0	8	1	1	0	0	2	0	3	0	0	3	14
3:45 PM	1	0	0	0	1	2	4	0	0	6	0	0	0	0	0	0	1	0	0	1	8
Total Volume	3	0	4	0	7	6	19	2	0	27	2	1	0	0	3	0	13	2	0	15	52
% Approach Total	42.9	0.0	57.1	0.0		22.2	70.4	7.4	0.0		66.7	33.3	0.0	0.0		0.0	86.7	13.3	0.0		
PHF	0.750	0.000	0.500	0.000	0.583	0.750	0.950	0.500	0.000	0.844	0.500	0.250	0.000	0.000	0.375	0.000	0.650	0.500	0.000	0.625	0.813
Buses	1	0	4	0	5	3	2	1	0	6	1	1	0	0	2	0	3	1	0	4	17
Buses %	33.3	0.0	100.0	0.0	71.4	50.0	10.5	50.0	0.0	22.2	50.0	100.0	0.0	0.0	66.7	0.0	23.1	50.0	0.0	26.7	32.7
Single-Unit Trucks	2	0	0	0	2	3	16	1	0	20	1	0	0	0	1	0	10	0	0	10	33
Single-Unit %	66.7	0.0	0.0	0.0	28.6	50.0	84.2	50.0	0.0	74.1	50.0	0.0	0.0	0.0	33.3	0.0	76.9	0.0	0.0	66.7	63.5
Articulated Trucks	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	2
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	6.7	3.8
Buses	1	0	4	0	5	3	2	1	0	6	1	1	0	0	2	0	3	1	0	4	17
Single-Unit Trucks	2	0	0	0	2	3	16	1	0	20	1	0	0	0	1	0	10	0	0	10	33
Articulated Trucks	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	2
Total Entering Leg	3	0	4	0	7	6	19	2	0	27	2	1	0	0	3	0	13	2	0	15	52
Buses	5					8					1					3					17
Single-Unit Trucks	3					11					1					18					33
Articulated Trucks	1					0					0					1					2
Total Exiting Leg	9					19					2					22					52

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	35	10	74	0	119	32	127	10	0	169	35	5	4	0	44	1	89	19	0	109	441
3:15 PM	32	6	65	0	103	41	132	12	0	185	17	5	1	0	23	4	94	19	0	117	428
3:30 PM	41	8	57	0	106	45	144	11	0	200	42	18	5	0	65	0	84	21	0	105	476
3:45 PM	24	6	63	0	93	36	156	12	0	204	20	8	0	0	28	3	111	32	0	146	471
Total	132	30	259	0	421	154	559	45	0	758	114	36	10	0	160	8	378	91	0	477	1816
4:00 PM	31	1	78	0	110	38	148	10	0	196	18	11	3	0	32	0	77	24	0	101	439
4:15 PM	26	2	80	0	108	52	165	1	0	218	19	2	7	0	28	0	95	20	0	115	469
4:30 PM	27	3	94	0	124	42	176	7	0	225	18	3	5	0	26	1	76	17	0	94	469
4:45 PM	36	2	84	0	122	38	200	11	0	249	21	4	7	0	32	0	68	24	0	92	495
Total	120	8	336	0	464	170	689	29	0	888	76	20	22	0	118	1	316	85	0	402	1872
5:00 PM	31	6	90	0	127	31	174	8	0	213	17	8	4	0	29	0	87	30	0	117	486
5:15 PM	30	2	86	0	118	35	177	4	0	216	27	12	3	0	42	1	75	27	0	103	479
5:30 PM	36	1	92	0	129	33	204	8	0	245	12	5	4	0	21	1	76	29	0	106	501
5:45 PM	28	2	103	0	133	34	169	6	0	209	20	1	3	0	24	1	62	23	0	86	452
Total	125	11	371	0	507	133	724	26	0	883	76	26	14	0	116	3	300	109	0	412	1918
Grand Total	377	49	966	0	1392	457	1972	100	0	2529	266	82	46	0	394	12	994	285	0	1291	5606
Approach %	27.1	3.5	69.4	0.0		18.1	78.0	4.0	0.0		67.5	20.8	11.7	0.0		0.9	77.0	22.1	0.0		
Total %	6.7	0.9	17.2	0.0	24.8	8.2	35.2	1.8	0.0	45.1	4.7	1.5	0.8	0.0	7.0	0.2	17.7	5.1	0.0	23.0	
Exiting Leg Total	824					2226					161					2395					5606

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:45 PM	36	2	84	0	122	38	200	11	0	249	21	4	7	0	32	0	68	24	0	92	495
5:00 PM	31	6	90	0	127	31	174	8	0	213	17	8	4	0	29	0	87	30	0	117	486
5:15 PM	30	2	86	0	118	35	177	4	0	216	27	12	3	0	42	1	75	27	0	103	479
5:30 PM	36	1	92	0	129	33	204	8	0	245	12	5	4	0	21	1	76	29	0	106	501
Total Volume	133	11	352	0	496	137	755	31	0	923	77	29	18	0	124	2	306	110	0	418	1961
% Approach Total	26.8	2.2	71.0	0.0		14.8	81.8	3.4	0.0		62.1	23.4	14.5	0.0		0.5	73.2	26.3	0.0		
PHF	0.924	0.458	0.957	0.000	0.961	0.901	0.925	0.705	0.000	0.927	0.713	0.604	0.643	0.000	0.738	0.500	0.879	0.917	0.000	0.893	0.979
Entering Leg	133	11	352	0	496	137	755	31	0	923	77	29	18	0	124	2	306	110	0	418	1961
Exiting Leg	276					735					44					906					1961
Total	772					1658					168					1324					3922

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Light Goods Vehicle**



	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	3	0	13	0	16	4	23	1	0	28	2	1	0	0	3	0	16	1	0	17	64
3:15 PM	1	0	4	0	5	5	24	2	0	31	0	0	0	0	0	0	15	2	0	17	53
3:30 PM	4	0	4	0	8	3	20	0	0	23	5	1	0	0	6	0	10	4	0	14	51
3:45 PM	2	1	4	0	7	5	23	3	0	31	1	0	0	0	1	0	9	3	0	12	51
Total	10	1	25	0	36	17	90	6	0	113	8	2	0	0	10	0	50	10	0	60	219
4:00 PM	3	0	3	0	6	6	20	1	0	27	0	1	1	0	2	0	6	3	0	9	44
4:15 PM	2	0	10	0	12	3	23	3	0	29	0	0	0	0	0	0	11	4	0	15	56
4:30 PM	0	0	6	0	6	2	13	0	0	15	1	0	0	0	1	0	15	1	0	16	38
4:45 PM	3	1	2	0	6	1	17	4	0	22	0	0	0	0	0	0	4	3	0	7	35
Total	8	1	21	0	30	12	73	8	0	93	1	1	1	0	3	0	36	11	0	47	173
5:00 PM	1	0	10	0	11	0	12	1	0	13	4	0	0	0	4	1	9	2	0	12	40
5:15 PM	2	0	2	0	4	3	11	1	0	15	2	1	0	0	3	1	2	1	0	4	26
5:30 PM	2	0	1	0	3	2	13	1	0	16	3	1	1	0	5	0	11	0	0	11	35
5:45 PM	1	0	0	0	1	0	7	0	0	7	3	0	0	0	3	0	13	1	0	14	25
Total	6	0	13	0	19	5	43	3	0	51	12	2	1	0	15	2	35	4	0	41	126
Grand Total	24	2	59	0	85	34	206	17	0	257	21	5	2	0	28	2	121	25	0	148	518
Approach %	28.2	2.4	69.4	0.0		13.2	80.2	6.6	0.0		75.0	17.9	7.1	0.0		1.4	81.8	16.9	0.0		
Total %	4.6	0.4	11.4	0.0	16.4	6.6	39.8	3.3	0.0	49.6	4.1	1.0	0.4	0.0	5.4	0.4	23.4	4.8	0.0	28.6	
Exiting Leg Total	64					201					21					232					518

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	3	0	13	0	16	4	23	1	0	28	2	1	0	0	3	0	16	1	0	17	64
3:15 PM	1	0	4	0	5	5	24	2	0	31	0	0	0	0	0	0	15	2	0	17	53
3:30 PM	4	0	4	0	8	3	20	0	0	23	5	1	0	0	6	0	10	4	0	14	51
3:45 PM	2	1	4	0	7	5	23	3	0	31	1	0	0	0	1	0	9	3	0	12	51
Total Volume	10	1	25	0	36	17	90	6	0	113	8	2	0	0	10	0	50	10	0	60	219
% Approach Total	27.8	2.8	69.4	0.0		15.0	79.6	5.3	0.0		80.0	20.0	0.0	0.0		0.0	83.3	16.7	0.0		
PHF	0.625	0.250	0.481	0.000	0.563	0.850	0.938	0.500	0.000	0.911	0.400	0.500	0.000	0.000	0.417	0.000	0.781	0.625	0.000	0.882	0.855
Entering Leg	10	1	25	0	36	17	90	6	0	113	8	2	0	0	10	0	50	10	0	60	219
Exiting Leg					29					83					7					100	219
Total					65					196					17					160	438

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
3:00 PM	1	0	2	0	3	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	5
3:15 PM	0	0	1	0	1	1	1	0	0	2	0	0	0	0	0	0	0	1	1	0	2	5
3:30 PM	0	0	1	0	1	1	0	1	0	2	1	1	0	0	2	0	1	0	0	0	1	6
3:45 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	1	0	4	0	5	3	2	1	0	6	1	1	0	0	2	0	3	1	0	4	17	
4:00 PM	0	0	1	0	1	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
4:15 PM	0	0	1	0	1	3	0	0	0	3	0	0	0	0	0	0	0	1	3	0	4	8
4:30 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	2	2	0	0	4	6
4:45 PM	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	0	3	0	3	5	3	0	0	8	0	0	0	0	0	0	3	5	0	8	19	
5:00 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	4	
5:15 PM	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	3	
5:30 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	
5:45 PM	0	1	0	0	1	3	1	0	0	4	0	0	0	0	0	0	0	0	0	0	5	
Total	0	1	3	0	4	4	2	0	0	6	0	0	0	0	0	0	2	2	0	4	14	
Grand Total	1	1	10	0	12	12	7	1	0	20	1	1	0	0	2	0	8	8	0	16	50	
Approach %	8.3	8.3	83.3	0.0		60.0	35.0	5.0	0.0		50.0	50.0	0.0	0.0		0.0	50.0	50.0	0.0			
Total %	2.0	2.0	20.0	0.0	24.0	24.0	14.0	2.0	0.0	40.0	2.0	2.0	0.0	0.0	4.0	0.0	16.0	16.0	0.0	32.0		
Exiting Leg Total	21					19					2					8					50	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:15 PM	0	0	1	0	1	3	0	0	0	3	0	0	0	0	0	0	1	3	0	4	8
4:30 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	2	2	0	4	6
4:45 PM	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	2
5:00 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	4
Total Volume	0	0	3	0	3	4	3	0	0	7	0	0	0	0	0	0	4	6	0	10	20
% Approach Total	0.0	0.0	100.0	0.0		57.1	42.9	0.0	0.0		0.0	0.0	0.0	0.0		0.0	40.0	60.0	0.0		
PHF	0.000	0.000	0.750	0.000	0.750	0.333	0.750	0.000	0.000	0.583	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.500	0.000	0.625	0.625
Entering Leg	0	0	3	0	3	4	3	0	0	7	0	0	0	0	0	0	4	6	0	10	20
Exiting Leg	10					7					0					3					20
Total	13					14					0					13					40

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	4	0	0	4	1	0	0	0	1	0	3	0	0	3	8
3:15 PM	1	0	0	0	1	1	4	1	0	6	0	0	0	0	0	0	4	0	0	4	11
3:30 PM	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	2	0	0	2	7
3:45 PM	1	0	0	0	1	1	4	0	0	5	0	0	0	0	0	0	1	0	0	1	7
Total	2	0	0	0	2	3	16	1	0	20	1	0	0	0	1	0	10	0	0	10	33
4:00 PM	0	0	0	0	0	3	3	0	0	6	1	0	0	0	1	0	0	1	0	1	8
4:15 PM	0	1	1	0	2	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	4
4:30 PM	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	1	0	0	1	3
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	0	1	1	0	2	4	5	0	0	9	2	0	0	0	2	0	3	1	0	4	17
5:00 PM	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	4	0	0	4	6
5:15 PM	0	2	0	0	2	0	1	0	0	1	0	1	0	0	1	0	0	1	0	1	5
5:30 PM	0	0	0	0	0	0	1	0	0	1	1	1	0	0	2	0	1	0	0	1	4
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	2	0	0	2	1	2	1	0	4	1	2	0	0	3	0	6	1	0	7	16
Grand Total	2	3	1	0	6	8	23	2	0	33	4	2	0	0	6	0	19	2	0	21	66
Approach %	33.3	50.0	16.7	0.0		24.2	69.7	6.1	0.0		66.7	33.3	0.0	0.0		0.0	90.5	9.5	0.0		
Total %	3.0	4.5	1.5	0.0	9.1	12.1	34.8	3.0	0.0	50.0	6.1	3.0	0.0	0.0	9.1	0.0	28.8	3.0	0.0	31.8	
Exiting Leg Total	12					24					5					25					66

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	4	0	0	4	1	0	0	0	1	0	3	0	0	3	8
3:15 PM	1	0	0	0	1	1	4	1	0	6	0	0	0	0	0	0	4	0	0	4	11
3:30 PM	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	2	0	0	2	7
3:45 PM	1	0	0	0	1	1	4	0	0	5	0	0	0	0	0	0	1	0	0	1	7
Total Volume	2	0	0	0	2	3	16	1	0	20	1	0	0	0	1	0	10	0	0	10	33
% Approach Total	100.0	0.0	0.0	0.0		15.0	80.0	5.0	0.0		100.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.500	0.000	0.000	0.000	0.500	0.750	1.000	0.250	0.000	0.833	0.250	0.000	0.000	0.000	0.250	0.000	0.625	0.000	0.000	0.625	0.750
Entering Leg	2	0	0	0	2	3	16	1	0	20	1	0	0	0	1	0	10	0	0	10	33
Exiting Leg					3					11				1						18	33
Total	5					31					2					28					66

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	2
4:00 PM	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	0	1	0	1	3	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	6
5:00 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1	2
5:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	2	0	0	2	4
Grand Total	0	0	1	0	1	3	5	0	0	8	0	0	0	0	0	0	0	2	1	0	3	12
Approach %	0.0	0.0	100.0	0.0		37.5	62.5	0.0	0.0		0.0	0.0	0.0	0.0		0.0	66.7	33.3	0.0			
Total %	0.0	0.0	8.3	0.0	8.3	25.0	41.7	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	16.7	8.3	0.0	25.0		
Exiting Leg Total	4					3					0					5					12	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:00 PM	Massachusetts Avenue					Marrett Road (Route 2A)					Minuteman High School Driveway					Marrett Road (Route 2A)					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
4:00 PM	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
Total Volume	0	0	1	0	1	3	2	0	0	5	0	0	0	0	0	0	0	0	0	0	6
% Approach Total	0.0	0.0	100.0	0.0		60.0	40.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.250	0.000	0.250	0.375	0.250	0.000	0.000	0.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.750
Entering Leg	0	0	1	0	1	3	2	0	0	5	0	0	0	0	0	0	0	0	0	0	6
Exiting Leg					3					1					0					2	6
Total					4					6					0					2	12

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Grand Total	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Approach %	100.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total %	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Exiting Leg Total	0							0							0							2							2

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)								
	from North							from East							from South							from West								
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Total Volume	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
% Approach Total	100.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0			
PHF	0.250	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500		
Entering Leg	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	
Exiting Leg	0							0							0							2							2	
Total	1							1							0							2							4	

PDI File #: **176038 B**
 Location: **N: Massachusetts Avenue S: Minuteman High School Driveway**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	0	0	0	0	0	0	0	0
Exiting Leg Total	0							0							1							0							1

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:00 PM	Massachusetts Avenue							Marrett Road (Route 2A)							Minuteman High School Driveway							Marrett Road (Route 2A)							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turns	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.250
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1
Exiting Leg	0							0							1							0							1
Total	0							0							2							0							2

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	8	0	0	8	1	90	0	91	47	16	0	63	162
6:15 AM	3	4	0	7	3	125	0	128	81	16	0	97	232
6:30 AM	4	2	0	6	2	140	0	142	121	12	0	133	281
6:45 AM	5	1	0	6	0	140	0	140	179	31	0	210	356
Total	20	7	0	27	6	495	0	501	428	75	0	503	1031
7:00 AM	8	4	0	12	0	127	0	127	176	22	0	198	337
7:15 AM	23	3	0	26	0	137	0	137	187	35	0	222	385
7:30 AM	18	3	0	21	2	188	0	190	206	30	0	236	447
7:45 AM	35	8	1	44	0	163	0	163	209	24	0	233	440
Total	84	18	1	103	2	615	0	617	778	111	0	889	1609
8:00 AM	31	7	0	38	2	138	0	140	180	28	0	208	386
8:15 AM	39	20	0	59	1	117	0	118	206	35	0	241	418
8:30 AM	36	38	0	74	2	144	0	146	187	34	0	221	441
8:45 AM	30	32	0	62	3	151	0	154	211	30	0	241	457
Total	136	97	0	233	8	550	0	558	784	127	0	911	1702
Grand Total	240	122	1	363	16	1660	0	1676	1990	313	0	2303	4342
Approach %	66.1	33.6	0.3		1.0	99.0	0.0		86.4	13.6	0.0		
Total %	5.5	2.8	0.0	8.4	0.4	38.2	0.0	38.6	45.8	7.2	0.0	53.0	
Exiting Leg Total				330				2112				1900	4342
Cars	231	121	1	353	11	1592	0	1603	1937	309	0	2246	4202
% Cars	96.3	99.2	100.0	97.2	68.8	95.9	0.0	95.6	97.3	98.7	0.0	97.5	96.8
Exiting Leg Total				321				2058				1823	4202
Heavy Vehicles	9	1	0	10	5	68	0	73	53	4	0	57	140
% Heavy Vehicles	3.8	0.8	0.0	2.8	31.3	4.1	0.0	4.4	2.7	1.3	0.0	2.5	3.2
Exiting Leg Total				9				54				77	140

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
8:00 AM	31	7	0	38	2	138	0	140	180	28	0	208	386
8:15 AM	39	20	0	59	1	117	0	118	206	35	0	241	418
8:30 AM	36	38	0	74	2	144	0	146	187	34	0	221	441
8:45 AM	30	32	0	62	3	151	0	154	211	30	0	241	457
Total Volume	136	97	0	233	8	550	0	558	784	127	0	911	1702
% Approach Total	58.4	41.6	0.0		1.4	98.6	0.0		86.1	13.9	0.0		
PHF	0.872	0.638	0.000	0.787	0.667	0.911	0.000	0.906	0.929	0.907	0.000	0.945	0.931
Cars	133	96	0	229	6	528	0	534	768	127	0	895	1658
Cars %	97.8	99.0	0.0	98.3	75.0	96.0	0.0	95.7	98.0	100.0	0.0	98.2	97.4
Heavy Vehicles	3	1	0	4	2	22	0	24	16	0	0	16	44
Heavy Vehicles %	2.2	1.0	0.0	1.7	25.0	4.0	0.0	4.3	2.0	0.0	0.0	1.8	2.6
Cars Enter Leg	133	96	0	229	6	528	0	534	768	127	0	895	1658
Heavy Enter Leg	3	1	0	4	2	22	0	24	16	0	0	16	44
Total Entering Leg	136	97	0	233	8	550	0	558	784	127	0	911	1702
Cars Exiting Leg				133				864				661	1658
Heavy Exiting Leg				2				17				25	44
Total Exiting Leg				135				881				686	1702

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	6	0	0	6	1	83	0	84	45	16	0	61	151
6:15 AM	3	4	0	7	2	120	0	122	79	16	0	95	224
6:30 AM	3	2	0	5	1	135	0	136	114	12	0	126	267
6:45 AM	5	1	0	6	0	137	0	137	174	30	0	204	347
Total	17	7	0	24	4	475	0	479	412	74	0	486	989
7:00 AM	7	4	0	11	0	122	0	122	172	22	0	194	327
7:15 AM	23	3	0	26	0	129	0	129	181	33	0	214	369
7:30 AM	17	3	0	20	1	180	0	181	198	30	0	228	429
7:45 AM	34	8	1	43	0	158	0	158	206	23	0	229	430
Total	81	18	1	100	1	589	0	590	757	108	0	865	1555
8:00 AM	30	7	0	37	1	133	0	134	176	28	0	204	375
8:15 AM	38	20	0	58	1	113	0	114	205	35	0	240	412
8:30 AM	36	37	0	73	1	137	0	138	182	34	0	216	427
8:45 AM	29	32	0	61	3	145	0	148	205	30	0	235	444
Total	133	96	0	229	6	528	0	534	768	127	0	895	1658
Grand Total	231	121	1	353	11	1592	0	1603	1937	309	0	2246	4202
Approach %	65.4	34.3	0.3		0.7	99.3	0.0		86.2	13.8	0.0		
Total %	5.5	2.9	0.0	8.4	0.3	37.9	0.0	38.1	46.1	7.4	0.0	53.5	
Exiting Leg Total	321				2058				1823				4202

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Massachusetts Avenue					Marrett Road (Route 2A)					Marrett Road (Route 2A)					Total
	from North					from East					from West					
	Right	Left	U-Turn		Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total			
8:00 AM	30	7	0		37	1	133	0	134	176	28	0	204	375		
8:15 AM	38	20	0		58	1	113	0	114	205	35	0	240	412		
8:30 AM	36	37	0		73	1	137	0	138	182	34	0	216	427		
8:45 AM	29	32	0		61	3	145	0	148	205	30	0	235	444		
Total Volume	133	96	0		229	6	528	0	534	768	127	0	895	1658		
% Approach Total	58.1	41.9	0.0			1.1	98.9	0.0		85.8	14.2	0.0				
PHF	0.875	0.649	0.000	0.784		0.500	0.910	0.000	0.902	0.937	0.907	0.000	0.932	0.934		
Entering Leg	133	96	0		229	6	528	0	534	768	127	0	895	1658		
Exiting Leg					133				864				661	1658		
Total					362				1398				1556	3316		

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	2	0	0	2	0	7	0	7	2	0	0	2	11
6:15 AM	0	0	0	0	1	5	0	6	2	0	0	2	8
6:30 AM	1	0	0	1	1	5	0	6	7	0	0	7	14
6:45 AM	0	0	0	0	0	3	0	3	5	1	0	6	9
Total	3	0	0	3	2	20	0	22	16	1	0	17	42
7:00 AM	1	0	0	1	0	5	0	5	4	0	0	4	10
7:15 AM	0	0	0	0	0	8	0	8	6	2	0	8	16
7:30 AM	1	0	0	1	1	8	0	9	8	0	0	8	18
7:45 AM	1	0	0	1	0	5	0	5	3	1	0	4	10
Total	3	0	0	3	1	26	0	27	21	3	0	24	54
8:00 AM	1	0	0	1	1	5	0	6	4	0	0	4	11
8:15 AM	1	0	0	1	0	4	0	4	1	0	0	1	6
8:30 AM	0	1	0	1	1	7	0	8	5	0	0	5	14
8:45 AM	1	0	0	1	0	6	0	6	6	0	0	6	13
Total	3	1	0	4	2	22	0	24	16	0	0	16	44
Grand Total	9	1	0	10	5	68	0	73	53	4	0	57	140
Approach %	90.0	10.0	0.0		6.8	93.2	0.0		93.0	7.0	0.0		
Total %	6.4	0.7	0.0	7.1	3.6	48.6	0.0	52.1	37.9	2.9	0.0	40.7	
Exiting Leg Total	9				54				77				140
Buses	8	0	0	8	5	5	0	10	9	2	0	11	29
% Buses	88.9	0.0	0.0	80.0	100.0	7.4	0.0	13.7	17.0	50.0	0.0	19.3	20.7
Exiting Leg Total	7				9				13				29
Single-Unit Trucks	1	1	0	2	0	55	0	55	37	2	0	39	96
% Single-Unit	11.1	100.0	0.0	20.0	0.0	80.9	0.0	75.3	69.8	50.0	0.0	68.4	68.6
Exiting Leg Total	2				38				56				96
Articulated Trucks	0	0	0	0	0	8	0	8	7	0	0	7	15
% Articulated	0.0	0.0	0.0	0.0	0.0	11.8	0.0	11.0	13.2	0.0	0.0	12.3	10.7
Exiting Leg Total	0				7				8				15

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:15 AM	0	0	0	0	0	8	0	8	6	2	0	8	16
7:30 AM	1	0	0	1	1	8	0	9	8	0	0	8	18
7:45 AM	1	0	0	1	0	5	0	5	3	1	0	4	10
8:00 AM	1	0	0	1	1	5	0	6	4	0	0	4	11
Total Volume	3	0	0	3	2	26	0	28	21	3	0	24	55
% Approach Total	100.0	0.0	0.0		7.1	92.9	0.0		87.5	12.5	0.0		
PHF	0.750	0.000	0.000	0.750	0.500	0.813	0.000	0.778	0.656	0.375	0.000	0.750	0.764
Buses	2	0	0	2	2	1	0	3	2	2	0	4	9
Buses %	66.7	0.0	0.0	66.7	100.0	3.8	0.0	10.7	9.5	66.7	0.0	16.7	16.4
Single-Unit Trucks	1	0	0	1	0	21	0	21	17	1	0	18	40
Single-Unit %	33.3	0.0	0.0	33.3	0.0	80.8	0.0	75.0	81.0	33.3	0.0	75.0	72.7
Articulated Trucks	0	0	0	0	0	4	0	4	2	0	0	2	6
Articulated %	0.0	0.0	0.0	0.0	0.0	15.4	0.0	14.3	9.5	0.0	0.0	8.3	10.9
Buses	2	0	0	2	2	1	0	3	2	2	0	4	9
Single-Unit Trucks	1	0	0	1	0	21	0	21	17	1	0	18	40
Articulated Trucks	0	0	0	0	0	4	0	4	2	0	0	2	6
Total Entering Leg	3	0	0	3	2	26	0	28	21	3	0	24	55
Buses	4				2				3				9
Single-Unit Trucks	1				17				22				40
Articulated Trucks	0				2				4				6
Total Exiting Leg	5				21				29				55

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	6	0	0	6	1	59	0	60	40	14	0	54	120
6:15 AM	2	3	0	5	2	89	0	91	60	15	0	75	171
6:30 AM	2	2	0	4	1	112	0	113	97	11	0	108	225
6:45 AM	5	1	0	6	0	110	0	110	146	27	0	173	289
Total	15	6	0	21	4	370	0	374	343	67	0	410	805
7:00 AM	7	4	0	11	0	103	0	103	146	21	0	167	281
7:15 AM	20	3	0	23	0	105	0	105	163	29	0	192	320
7:30 AM	15	3	0	18	1	155	0	156	174	27	0	201	375
7:45 AM	31	8	1	40	0	141	0	141	195	23	0	218	399
Total	73	18	1	92	1	504	0	505	678	100	0	778	1375
8:00 AM	25	7	0	32	1	119	0	120	168	26	0	194	346
8:15 AM	37	18	0	55	1	96	0	97	193	34	0	227	379
8:30 AM	33	34	0	67	1	124	0	125	159	33	0	192	384
8:45 AM	27	28	0	55	3	132	0	135	193	30	0	223	413
Total	122	87	0	209	6	471	0	477	713	123	0	836	1522
Grand Total	210	111	1	322	11	1345	0	1356	1734	290	0	2024	3702
Approach %	65.2	34.5	0.3		0.8	99.2	0.0		85.7	14.3	0.0		
Total %	5.7	3.0	0.0	8.7	0.3	36.3	0.0	36.6	46.8	7.8	0.0	54.7	
Exiting Leg Total				302				1845				1555	3702

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
8:00 AM	25	7	0	32	1	119	0	120	168	26	0	194	346
8:15 AM	37	18	0	55	1	96	0	97	193	34	0	227	379
8:30 AM	33	34	0	67	1	124	0	125	159	33	0	192	384
8:45 AM	27	28	0	55	3	132	0	135	193	30	0	223	413
Total Volume	122	87	0	209	6	471	0	477	713	123	0	836	1522
% Approach Total	58.4	41.6	0.0		1.3	98.7	0.0		85.3	14.7	0.0		
PHF	0.824	0.640	0.000	0.780	0.500	0.892	0.000	0.883	0.924	0.904	0.000	0.921	0.921
Entering Leg	122	87	0	209	6	471	0	477	713	123	0	836	1522
Exiting Leg				129				800				593	1522
Total				338				1277				1429	3044

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Light Goods Vehicle

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	24	0	24	5	2	0	7	31
6:15 AM	1	1	0	2	0	31	0	31	19	1	0	20	53
6:30 AM	1	0	0	1	0	23	0	23	17	1	0	18	42
6:45 AM	0	0	0	0	0	27	0	27	28	3	0	31	58
Total	2	1	0	3	0	105	0	105	69	7	0	76	184
7:00 AM	0	0	0	0	0	19	0	19	26	1	0	27	46
7:15 AM	3	0	0	3	0	24	0	24	18	4	0	22	49
7:30 AM	2	0	0	2	0	25	0	25	24	3	0	27	54
7:45 AM	3	0	0	3	0	17	0	17	11	0	0	11	31
Total	8	0	0	8	0	85	0	85	79	8	0	87	180
8:00 AM	5	0	0	5	0	14	0	14	8	2	0	10	29
8:15 AM	1	2	0	3	0	17	0	17	12	1	0	13	33
8:30 AM	3	3	0	6	0	13	0	13	23	1	0	24	43
8:45 AM	2	4	0	6	0	13	0	13	12	0	0	12	31
Total	11	9	0	20	0	57	0	57	55	4	0	59	136
Grand Total	21	10	0	31	0	247	0	247	203	19	0	222	500
Approach %	67.7	32.3	0.0		0.0	100.0	0.0		91.4	8.6	0.0		
Total %	4.2	2.0	0.0	6.2	0.0	49.4	0.0	49.4	40.6	3.8	0.0	44.4	
Exiting Leg Total	19				213				268				500

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Old Massachusetts Avenue					Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:45 AM	0	0	0	0	0	0	27	0	27	28	3	0	31	58
7:00 AM	0	0	0	0	0	0	19	0	19	26	1	0	27	46
7:15 AM	3	0	0	3	0	0	24	0	24	18	4	0	22	49
7:30 AM	2	0	0	2	0	0	25	0	25	24	3	0	27	54
Total Volume	5	0	0	5	0	95	0	95	96	11	0	107	207	
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		89.7	10.3	0.0			
PHF	0.417	0.000	0.000	0.417	0.000	0.880	0.000	0.880	0.857	0.688	0.000	0.863	0.892	
Entering Leg	5	0	0	5	0	95	0	95	96	11	0	107	207	
Exiting Leg				11				96				100	207	
Total				16				191				207	414	

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	2	0	0	2	0	0	0	0	1	0	0	1	3
6:15 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
6:30 AM	1	0	0	1	1	0	0	1	0	0	0	0	2
6:45 AM	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	3	0	0	3	2	0	0	2	3	0	0	3	8
7:00 AM	1	0	0	1	0	1	0	1	1	0	0	1	3
7:15 AM	0	0	0	0	0	1	0	1	0	1	0	1	2
7:30 AM	1	0	0	1	1	0	0	1	1	0	0	1	3
7:45 AM	1	0	0	1	0	0	0	0	1	1	0	2	3
Total	3	0	0	3	1	2	0	3	3	2	0	5	11
8:00 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
8:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	1	2	0	3	1	0	0	1	4
8:45 AM	1	0	0	1	0	1	0	1	2	0	0	2	4
Total	2	0	0	2	2	3	0	5	3	0	0	3	10
Grand Total	8	0	0	8	5	5	0	10	9	2	0	11	29
Approach %	100.0	0.0	0.0		50.0	50.0	0.0		81.8	18.2	0.0		
Total %	27.6	0.0	0.0	27.6	17.2	17.2	0.0	34.5	31.0	6.9	0.0	37.9	
Exiting Leg Total	7				9				13				29

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:00 AM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:00 AM	1	0	0	1	0	1	0	1	1	0	0	1	3
7:15 AM	0	0	0	0	0	1	0	1	0	1	0	1	2
7:30 AM	1	0	0	1	1	0	0	1	1	0	0	1	3
7:45 AM	1	0	0	1	0	0	0	0	1	1	0	2	3
Total Volume	3	0	0	3	1	2	0	3	3	2	0	5	11
% Approach Total	100.0	0.0	0.0		33.3	66.7	0.0		60.0	40.0	0.0		
PHF	0.750	0.000	0.000	0.750	0.250	0.500	0.000	0.750	0.750	0.500	0.000	0.625	0.917
Entering Leg	3	0	0	3	1	2	0	3	3	2	0	5	11
Exiting Leg				3				3				5	11
Total				6				6				10	22

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	5	0	5	1	0	0	1	6
6:15 AM	0	0	0	0	0	5	0	5	2	0	0	2	7
6:30 AM	0	0	0	0	0	3	0	3	5	0	0	5	8
6:45 AM	0	0	0	0	0	3	0	3	3	1	0	4	7
Total	0	0	0	0	0	16	0	16	11	1	0	12	28
7:00 AM	0	0	0	0	0	4	0	4	2	0	0	2	6
7:15 AM	0	0	0	0	0	4	0	4	5	1	0	6	10
7:30 AM	0	0	0	0	0	7	0	7	6	0	0	6	13
7:45 AM	0	0	0	0	0	5	0	5	2	0	0	2	7
Total	0	0	0	0	0	20	0	20	15	1	0	16	36
8:00 AM	1	0	0	1	0	5	0	5	4	0	0	4	10
8:15 AM	0	0	0	0	0	4	0	4	1	0	0	1	5
8:30 AM	0	1	0	1	0	5	0	5	3	0	0	3	9
8:45 AM	0	0	0	0	0	5	0	5	3	0	0	3	8
Total	1	1	0	2	0	19	0	19	11	0	0	11	32
Grand Total	1	1	0	2	0	55	0	55	37	2	0	39	96
Approach %	50.0	50.0	0.0		0.0	100.0	0.0		94.9	5.1	0.0		
Total %	1.0	1.0	0.0	2.1	0.0	57.3	0.0	57.3	38.5	2.1	0.0	40.6	
Exiting Leg Total	2				38				56				96

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:15 AM	0	0	0	0	0	4	0	4	5	1	0	6	10
7:30 AM	0	0	0	0	0	7	0	7	6	0	0	6	13
7:45 AM	0	0	0	0	0	5	0	5	2	0	0	2	7
8:00 AM	1	0	0	1	0	5	0	5	4	0	0	4	10
Total Volume	1	0	0	1	0	21	0	21	17	1	0	18	40
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		94.4	5.6	0.0		
PHF	0.250	0.000	0.000	0.250	0.000	0.750	0.000	0.750	0.708	0.250	0.000	0.750	0.769
Entering Leg	1	0	0	1	0	21	0	21	17	1	0	18	40
Exiting Leg				1				17				22	40
Total				2				38				40	80

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	2	0	2	0	0	0	0	2
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	2	0	2	2	0	0	2	4
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	4	0	4	2	0	0	2	6
7:00 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
7:15 AM	0	0	0	0	0	3	0	3	1	0	0	1	4
7:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	4	0	4	3	0	0	3	7
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	0	0	0	2	0	0	2	2
Grand Total	0	0	0	0	0	8	0	8	7	0	0	7	15
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	53.3	0.0	53.3	46.7	0.0	0.0	46.7	
Exiting Leg Total	0				7				8				15

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:30 AM	0	0	0	0	0	2	0	2	2	0	0	2	4
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
7:15 AM	0	0	0	0	0	3	0	3	1	0	0	1	4
Total Volume	0	0	0	0	0	5	0	5	4	0	0	4	9
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.417	0.000	0.417	0.500	0.000	0.000	0.500	0.563
Entering Leg	0	0	0	0	0	5	0	5	4	0	0	4	9
Exiting Leg				0				4				5	9
Total				0				9				9	18

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
7:45 AM	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	2	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	1	3
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Grand Total	2	0	0	0	0	2	0	1	0	0	0	1	1	0	0	0	0	1	4
Approach %	100.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		
Total %	50.0	0.0	0.0	0.0	0.0	50.0	0.0	25.0	0.0	0.0	0.0	25.0	25.0	0.0	0.0	0.0	0.0	25.0	
Exiting Leg Total	0						1						3						4

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:00 AM	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
7:45 AM	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	2	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	1	3
% Approach Total	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		
PHF	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.375
Entering Leg	2	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	1	3
Exiting Leg	0						1						2						3
Total	2						1						3						6

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0
Total	0						0						0						0

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	19	3	0	22	3	195	0	198	123	16	0	139	359
3:15 PM	27	3	0	30	1	192	0	193	142	13	0	155	378
3:30 PM	31	1	0	32	4	221	0	225	131	9	0	140	397
3:45 PM	20	1	0	21	1	202	0	203	147	11	0	158	382
Total	97	8	0	105	9	810	0	819	543	49	0	592	1516
4:00 PM	43	1	0	44	3	209	0	212	112	17	0	129	385
4:15 PM	33	3	0	36	3	222	0	225	129	12	0	141	402
4:30 PM	39	5	0	44	2	221	0	223	108	10	0	118	385
4:45 PM	27	2	0	29	0	264	0	264	97	13	0	110	403
Total	142	11	0	153	8	916	0	924	446	52	0	498	1575
5:00 PM	45	4	0	49	4	217	0	221	133	13	0	146	416
5:15 PM	45	4	0	49	4	223	1	228	105	13	0	118	395
5:30 PM	43	3	0	46	4	254	0	258	116	6	0	122	426
5:45 PM	42	5	0	47	5	208	0	213	97	15	0	112	372
Total	175	16	0	191	17	902	1	920	451	47	0	498	1609
Grand Total	414	35	0	449	34	2628	1	2663	1440	148	0	1588	4700
Approach %	92.2	7.8	0.0		1.3	98.7	0.0		90.7	9.3	0.0		
Total %	8.8	0.7	0.0	9.6	0.7	55.9	0.0	56.7	30.6	3.1	0.0	33.8	
Exiting Leg Total	182				1476				3042				4700
Cars	410	32	0	442	34	2591	1	2626	1403	143	0	1546	4614
% Cars	99.0	91.4	0.0	98.4	100.0	98.6	100.0	98.6	97.4	96.6	0.0	97.4	98.2
Exiting Leg Total	177				1436				3001				4614
Heavy Vehicles	4	3	0	7	0	37	0	37	37	5	0	42	86
% Heavy Vehicles	1.0	8.6	0.0	1.6	0.0	1.4	0.0	1.4	2.6	3.4	0.0	2.6	1.8
Exiting Leg Total	5				40				41				86

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:45 PM	27	2	0	29	0	264	0	264	97	13	0	110	403
5:00 PM	45	4	0	49	4	217	0	221	133	13	0	146	416
5:15 PM	45	4	0	49	4	223	1	228	105	13	0	118	395
5:30 PM	43	3	0	46	4	254	0	258	116	6	0	122	426
Total Volume	160	13	0	173	12	958	1	971	451	45	0	496	1640
% Approach Total	92.5	7.5	0.0		1.2	98.7	0.1		90.9	9.1	0.0		
PHF	0.889	0.813	0.000	0.883	0.750	0.907	0.250	0.920	0.848	0.865	0.000	0.849	0.962
Cars	160	11	0	171	12	950	1	963	439	43	0	482	1616
Cars %	100.0	84.6	0.0	98.8	100.0	99.2	100.0	99.2	97.3	95.6	0.0	97.2	98.5
Heavy Vehicles	0	2	0	2	0	8	0	8	12	2	0	14	24
Heavy Vehicles %	0.0	15.4	0.0	1.2	0.0	0.8	0.0	0.8	2.7	4.4	0.0	2.8	1.5
Cars Enter Leg	160	11	0	171	12	950	1	963	439	43	0	482	1616
Heavy Enter Leg	0	2	0	2	0	8	0	8	12	2	0	14	24
Total Entering Leg	160	13	0	173	12	958	1	971	451	45	0	496	1640
Cars Exiting Leg				55				451				1110	1616
Heavy Exiting Leg				2				14				8	24
Total Exiting Leg				57				465				1118	1640

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**



Class: **Cars-Combined (Motorcycles, Cars, Light Goods)**

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	18	3	0	21	3	189	0	192	119	15	0	134	347
3:15 PM	27	3	0	30	1	186	0	187	136	13	0	149	366
3:30 PM	31	1	0	32	4	217	0	221	128	8	0	136	389
3:45 PM	19	1	0	20	1	197	0	198	146	11	0	157	375
Total	95	8	0	103	9	789	0	798	529	47	0	576	1477
4:00 PM	43	1	0	44	3	205	0	208	110	17	0	127	379
4:15 PM	33	3	0	36	3	221	0	224	126	11	0	137	397
4:30 PM	39	4	0	43	2	219	0	221	103	10	0	113	377
4:45 PM	27	2	0	29	0	261	0	261	95	12	0	107	397
Total	142	10	0	152	8	906	0	914	434	50	0	484	1550
5:00 PM	45	3	0	48	4	215	0	219	127	13	0	140	407
5:15 PM	45	4	0	49	4	221	1	226	102	12	0	114	389
5:30 PM	43	2	0	45	4	253	0	257	115	6	0	121	423
5:45 PM	40	5	0	45	5	207	0	212	96	15	0	111	368
Total	173	14	0	187	17	896	1	914	440	46	0	486	1587
Grand Total	410	32	0	442	34	2591	1	2626	1403	143	0	1546	4614
Approach %	92.8	7.2	0.0		1.3	98.7	0.0		90.8	9.2	0.0		
Total %	8.9	0.7	0.0	9.6	0.7	56.2	0.0	56.9	30.4	3.1	0.0	33.5	
Exiting Leg Total				177				1436				3001	4614

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Old Massachusetts Avenue					Marrett Road (Route 2A)					Marrett Road (Route 2A)					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total			
4:45 PM	27	2	0	0	29	0	261	0	261	95	12	0	107	397		
5:00 PM	45	3	0	0	48	4	215	0	219	127	13	0	140	407		
5:15 PM	45	4	0	0	49	4	221	1	226	102	12	0	114	389		
5:30 PM	43	2	0	0	45	4	253	0	257	115	6	0	121	423		
Total Volume	160	11	0	0	171	12	950	1	963	439	43	0	482	1616		
% Approach Total	93.6	6.4	0.0	0.0		1.2	98.7	0.1		91.1	8.9	0.0				
PHF	0.889	0.688	0.000	0.872		0.750	0.910	0.250	0.922	0.864	0.827	0.000	0.861	0.955		
Entering Leg	160	11	0	0	171	12	950	1	963	439	43	0	482	1616		
Exiting Leg					55				451				1110	1616		
Total					226				1414				1592	3232		

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**



Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	1	0	0	1	0	6	0	6	4	1	0	5	12
3:15 PM	0	0	0	0	0	6	0	6	6	0	0	6	12
3:30 PM	0	0	0	0	0	4	0	4	3	1	0	4	8
3:45 PM	1	0	0	1	0	5	0	5	1	0	0	1	7
Total	2	0	0	2	0	21	0	21	14	2	0	16	39
4:00 PM	0	0	0	0	0	4	0	4	2	0	0	2	6
4:15 PM	0	0	0	0	0	1	0	1	3	1	0	4	5
4:30 PM	0	1	0	1	0	2	0	2	5	0	0	5	8
4:45 PM	0	0	0	0	0	3	0	3	2	1	0	3	6
Total	0	1	0	1	0	10	0	10	12	2	0	14	25
5:00 PM	0	1	0	1	0	2	0	2	6	0	0	6	9
5:15 PM	0	0	0	0	0	2	0	2	3	1	0	4	6
5:30 PM	0	1	0	1	0	1	0	1	1	0	0	1	3
5:45 PM	2	0	0	2	0	1	0	1	1	0	0	1	4
Total	2	2	0	4	0	6	0	6	11	1	0	12	22
Grand Total	4	3	0	7	0	37	0	37	37	5	0	42	86
Approach %	57.1	42.9	0.0		0.0	100.0	0.0		88.1	11.9	0.0		
Total %	4.7	3.5	0.0	8.1	0.0	43.0	0.0	43.0	43.0	5.8	0.0	48.8	
Exiting Leg Total	5				40				41				86
Buses	1	3	0	4	0	8	0	8	12	5	0	17	29
% Buses	25.0	100.0	0.0	57.1	0.0	21.6	0.0	21.6	32.4	100.0	0.0	40.5	33.7
Exiting Leg Total	5				15				9				29
Single-Unit Trucks	2	0	0	2	0	25	0	25	22	0	0	22	49
% Single-Unit	50.0	0.0	0.0	28.6	0.0	67.6	0.0	67.6	59.5	0.0	0.0	52.4	57.0
Exiting Leg Total	0				22				27				49
Articulated Trucks	1	0	0	1	0	4	0	4	3	0	0	3	8
% Articulated	25.0	0.0	0.0	14.3	0.0	10.8	0.0	10.8	8.1	0.0	0.0	7.1	9.3
Exiting Leg Total	0				3				5				8

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	1	0	0	1	0	6	0	6	4	1	0	5	12
3:15 PM	0	0	0	0	0	6	0	6	6	0	0	6	12
3:30 PM	0	0	0	0	0	4	0	4	3	1	0	4	8
3:45 PM	1	0	0	1	0	5	0	5	1	0	0	1	7
Total Volume	2	0	0	2	0	21	0	21	14	2	0	16	39
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		87.5	12.5	0.0		
PHF	0.500	0.000	0.000	0.500	0.000	0.875	0.000	0.875	0.583	0.500	0.000	0.667	0.813
Buses	1	0	0	1	0	3	0	3	3	2	0	5	9
Buses %	50.0	0.0	0.0	50.0	0.0	14.3	0.0	14.3	21.4	100.0	0.0	31.3	23.1
Single-Unit Trucks	1	0	0	1	0	18	0	18	10	0	0	10	29
Single-Unit %	50.0	0.0	0.0	50.0	0.0	85.7	0.0	85.7	71.4	0.0	0.0	62.5	74.4
Articulated Trucks	0	0	0	0	0	0	0	0	1	0	0	1	1
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	6.3	2.6
Buses	1	0	0	1	0	3	0	3	3	2	0	5	9
Single-Unit Trucks	1	0	0	1	0	18	0	18	10	0	0	10	29
Articulated Trucks	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Entering Leg	2	0	0	2	0	21	0	21	14	2	0	16	39
Buses				2				3				4	9
Single-Unit Trucks				0				10				19	29
Articulated Trucks				0				1				0	1
Total Exiting Leg				2				14				23	39

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	18	3	0	21	2	160	0	162	103	13	0	116	299
3:15 PM	25	2	0	27	1	162	0	163	118	12	0	130	320
3:30 PM	29	1	0	30	3	189	0	192	117	7	0	124	346
3:45 PM	14	1	0	15	1	173	0	174	134	10	0	144	333
Total	86	7	0	93	7	684	0	691	472	42	0	514	1298
4:00 PM	43	1	0	44	3	178	0	181	99	14	0	113	338
4:15 PM	32	3	0	35	2	198	0	200	114	10	0	124	359
4:30 PM	37	3	0	40	2	206	0	208	89	10	0	99	347
4:45 PM	25	2	0	27	0	242	0	242	89	12	0	101	370
Total	137	9	0	146	7	824	0	831	391	46	0	437	1414
5:00 PM	44	2	0	46	4	199	0	203	115	11	0	126	375
5:15 PM	45	4	0	49	4	208	1	213	98	11	0	109	371
5:30 PM	42	2	0	44	3	239	0	242	101	6	0	107	393
5:45 PM	35	5	0	40	4	199	0	203	83	12	0	95	338
Total	166	13	0	179	15	845	1	861	397	40	0	437	1477
Grand Total	389	29	0	418	29	2353	1	2383	1260	128	0	1388	4189
Approach %	93.1	6.9	0.0		1.2	98.7	0.0		90.8	9.2	0.0		
Total %	9.3	0.7	0.0	10.0	0.7	56.2	0.0	56.9	30.1	3.1	0.0	33.1	
Exiting Leg Total				157				1290				2742	4189

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:45 PM	25	2	0	27	0	242	0	242	89	12	0	101	370
5:00 PM	44	2	0	46	4	199	0	203	115	11	0	126	375
5:15 PM	45	4	0	49	4	208	1	213	98	11	0	109	371
5:30 PM	42	2	0	44	3	239	0	242	101	6	0	107	393
Total Volume	156	10	0	166	11	888	1	900	403	40	0	443	1509
% Approach Total	94.0	6.0	0.0		1.2	98.7	0.1		91.0	9.0	0.0		
PHF	0.867	0.625	0.000	0.847	0.688	0.917	0.250	0.930	0.876	0.833	0.000	0.879	0.960
Entering Leg	156	10	0	166	11	888	1	900	403	40	0	443	1509
Exiting Leg				51				414				1044	1509
Total				217				1314				1487	3018

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Light Goods Vehicle

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	1	29	0	30	16	2	0	18	48
3:15 PM	2	1	0	3	0	24	0	24	18	1	0	19	46
3:30 PM	2	0	0	2	1	28	0	29	11	1	0	12	43
3:45 PM	5	0	0	5	0	24	0	24	12	1	0	13	42
Total	9	1	0	10	2	105	0	107	57	5	0	62	179
4:00 PM	0	0	0	0	0	27	0	27	11	3	0	14	41
4:15 PM	1	0	0	1	1	23	0	24	12	1	0	13	38
4:30 PM	2	1	0	3	0	13	0	13	14	0	0	14	30
4:45 PM	2	0	0	2	0	19	0	19	6	0	0	6	27
Total	5	1	0	6	1	82	0	83	43	4	0	47	136
5:00 PM	1	1	0	2	0	15	0	15	12	2	0	14	31
5:15 PM	0	0	0	0	0	13	0	13	4	1	0	5	18
5:30 PM	1	0	0	1	1	14	0	15	14	0	0	14	30
5:45 PM	5	0	0	5	1	8	0	9	13	3	0	16	30
Total	7	1	0	8	2	50	0	52	43	6	0	49	109
Grand Total	21	3	0	24	5	237	0	242	143	15	0	158	424
Approach %	87.5	12.5	0.0		2.1	97.9	0.0		90.5	9.5	0.0		
Total %	5.0	0.7	0.0	5.7	1.2	55.9	0.0	57.1	33.7	3.5	0.0	37.3	
Exiting Leg Total	20				146				258				424

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Massachusetts Avenue					Marrett Road (Route 2A)					Marrett Road (Route 2A)					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total			
3:00 PM	0	0	0	0		1	29	0	30	16	2	0	18	48		
3:15 PM	2	1	0	3		0	24	0	24	18	1	0	19	46		
3:30 PM	2	0	0	2		1	28	0	29	11	1	0	12	43		
3:45 PM	5	0	0	5		0	24	0	24	12	1	0	13	42		
Total Volume	9	1	0	10		2	105	0	107	57	5	0	62	179		
% Approach Total	90.0	10.0	0.0			1.9	98.1	0.0		91.9	8.1	0.0				
PHF	0.450	0.250	0.000	0.500		0.500	0.905	0.000	0.892	0.792	0.625	0.000	0.816	0.932		
Entering Leg	9	1	0	10		2	105	0	107	57	5	0	62	179		
Exiting Leg						7	58						114	179		
Total	17					165					176					358

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Old Massachusetts Avenue					Marrett Road (Route 2A)					Marrett Road (Route 2A)					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total		Thru	Left	U-Turn	Total		
3:00 PM	1	0	0	1		0	2	0	2		1	1	0	2		5
3:15 PM	0	0	0	0		0	1	0	1		1	0	0	1		2
3:30 PM	0	0	0	0		0	0	0	0		1	1	0	2		2
3:45 PM	0	0	0	0		0	0	0	0		0	0	0	0		0
Total	1	0	0	1		0	3	0	3		3	2	0	5		9
4:00 PM	0	0	0	0		0	1	0	1		1	0	0	1		2
4:15 PM	0	0	0	0		0	0	0	0		3	1	0	4		4
4:30 PM	0	1	0	1		0	1	0	1		3	0	0	3		5
4:45 PM	0	0	0	0		0	1	0	1		0	1	0	1		2
Total	0	1	0	1		0	3	0	3		7	2	0	9		13
5:00 PM	0	1	0	1		0	1	0	1		1	0	0	1		3
5:15 PM	0	0	0	0		0	0	0	0		1	1	0	2		2
5:30 PM	0	1	0	1		0	0	0	0		0	0	0	0		1
5:45 PM	0	0	0	0		0	1	0	1		0	0	0	0		1
Total	0	2	0	2		0	2	0	2		2	1	0	3		7
Grand Total	1	3	0	4		0	8	0	8		12	5	0	17		29
Approach %	25.0	75.0	0.0			0.0	100.0	0.0			70.6	29.4	0.0			
Total %	3.4	10.3	0.0	13.8		0.0	27.6	0.0	27.6		41.4	17.2	0.0	58.6		
Exiting Leg Total	5					15					9					29

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:15 PM	0	0	0	0	0	0	0	0	3	1	0	4	4
4:30 PM	0	1	0	1	0	1	0	1	3	0	0	3	5
4:45 PM	0	0	0	0	0	1	0	1	0	1	0	1	2
5:00 PM	0	1	0	1	0	1	0	1	1	0	0	1	3
Total Volume	0	2	0	2	0	3	0	3	7	2	0	9	14
% Approach Total	0.0	100.0	0.0		0.0	100.0	0.0		77.8	22.2	0.0		
PHF	0.000	0.500	0.000	0.500	0.000	0.750	0.000	0.750	0.583	0.500	0.000	0.563	0.700
Entering Leg	0	2	0	2	0	3	0	3	7	2	0	9	14
Exiting Leg				2				9				3	14
Total				4				12				12	28

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	4	0	4	2	0	0	2	6
3:15 PM	0	0	0	0	0	5	0	5	5	0	0	5	10
3:30 PM	0	0	0	0	0	4	0	4	2	0	0	2	6
3:45 PM	1	0	0	1	0	5	0	5	1	0	0	1	7
Total	1	0	0	1	0	18	0	18	10	0	0	10	29
4:00 PM	0	0	0	0	0	3	0	3	1	0	0	1	4
4:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
4:30 PM	0	0	0	0	0	1	0	1	2	0	0	2	3
4:45 PM	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	0	0	0	0	0	5	0	5	5	0	0	5	10
5:00 PM	0	0	0	0	0	0	0	0	4	0	0	4	4
5:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:30 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:45 PM	1	0	0	1	0	0	0	0	1	0	0	1	2
Total	1	0	0	1	0	2	0	2	7	0	0	7	10
Grand Total	2	0	0	2	0	25	0	25	22	0	0	22	49
Approach %	100.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	4.1	0.0	0.0	4.1	0.0	51.0	0.0	51.0	44.9	0.0	0.0	44.9	
Exiting Leg Total	0				22				27				49

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	4	0	4	2	0	0	2	6
3:15 PM	0	0	0	0	0	5	0	5	5	0	0	5	10
3:30 PM	0	0	0	0	0	4	0	4	2	0	0	2	6
3:45 PM	1	0	0	1	0	5	0	5	1	0	0	1	7
Total Volume	1	0	0	1	0	18	0	18	10	0	0	10	29
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.250	0.000	0.000	0.250	0.000	0.900	0.000	0.900	0.500	0.000	0.000	0.500	0.725
Entering Leg	1	0	0	1	0	18	0	18	10	0	0	10	29
Exiting Leg				0				10				19	29
Total				1				28				29	58

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	1	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	2	0	2	0	0	0	0	2
Total	0	0	0	0	0	2	0	2	0	0	0	0	2
5:00 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total	1	0	0	1	0	2	0	2	2	0	0	2	5
Grand Total	1	0	0	1	0	4	0	4	3	0	0	3	8
Approach %	100.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	12.5	0.0	0.0	12.5	0.0	50.0	0.0	50.0	37.5	0.0	0.0	37.5	
Exiting Leg Total	0				3				5				8

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Old Massachusetts Avenue				Marrett Road (Route 2A)				Marrett Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	2	0	2	0	0	0	0	2
5:00 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
Total Volume	0	0	0	0	0	4	0	4	2	0	0	2	6
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.500	0.000	0.000	0.500	0.750
Entering Leg	0	0	0	0	0	4	0	4	2	0	0	2	6
Exiting Leg				0				2				4	6
Total				0				6				6	12

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Grand Total	1	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	2
Approach %	100.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total %	50.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	0						0						2						2

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Approach Total	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0			
PHF	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.250
Entering Leg	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Exiting Leg	0						0						1						1	
Total	1						0						1						2	

PDI File #: **176038 C**
 Location: **N: Old Massachusetts Avenue**
 Location: **E: Marrett Road (Route 2A) W: Marrett Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Massachusetts Avenue						Marrett Road (Route 2A)						Marrett Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0	
Total	0						0						0						0	

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	1	0	1	1	95	0	96	62	0	0	62	159
6:15 AM	0	0	0	0	0	132	0	132	98	0	0	98	230
6:30 AM	0	0	0	0	0	145	0	145	134	1	0	135	280
6:45 AM	0	1	0	1	0	143	0	143	208	1	0	209	353
Total	0	2	0	2	1	515	0	516	502	2	0	504	1022
7:00 AM	1	0	0	1	0	138	0	138	200	0	0	200	339
7:15 AM	0	0	0	0	0	156	0	156	220	0	0	220	376
7:30 AM	0	0	0	0	0	207	0	207	234	0	0	234	441
7:45 AM	0	0	0	0	0	197	0	197	237	0	0	237	434
Total	1	0	0	1	0	698	0	698	891	0	0	891	1590
8:00 AM	0	0	0	0	0	170	0	170	206	0	0	206	376
8:15 AM	2	0	0	2	1	151	0	152	248	2	0	250	404
8:30 AM	0	0	0	0	2	179	0	181	224	1	0	225	406
8:45 AM	1	0	0	1	1	182	0	183	234	1	0	235	419
Total	3	0	0	3	4	682	0	686	912	4	0	916	1605
Grand Total	4	2	0	6	5	1895	0	1900	2305	6	0	2311	4217
Approach %	66.7	33.3	0.0		0.3	99.7	0.0		99.7	0.3	0.0		
Total %	0.1	0.0	0.0	0.1	0.1	44.9	0.0	45.1	54.7	0.1	0.0	54.8	
Exiting Leg Total	11				2307				1899				4217
Cars	4	1	0	5	4	1821	0	1825	2248	6	0	2254	4084
% Cars	100.0	50.0	0.0	83.3	80.0	96.1	0.0	96.1	97.5	100.0	0.0	97.5	96.8
Exiting Leg Total	10				2249				1825				4084
Heavy Vehicles	0	1	0	1	1	74	0	75	57	0	0	57	133
% Heavy Vehicles	0.0	50.0	0.0	16.7	20.0	3.9	0.0	3.9	2.5	0.0	0.0	2.5	3.2
Exiting Leg Total	1				58				74				133

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:30 AM	0	0	0	0	0	207	0	207	234	0	0	234	441
7:45 AM	0	0	0	0	0	197	0	197	237	0	0	237	434
8:00 AM	0	0	0	0	0	170	0	170	206	0	0	206	376
8:15 AM	2	0	0	2	1	151	0	152	248	2	0	250	404
Total Volume	2	0	0	2	1	725	0	726	925	2	0	927	1655
% Approach Total	100.0	0.0	0.0		0.1	99.9	0.0		99.8	0.2	0.0		
PHF	0.250	0.000	0.000	0.250	0.250	0.876	0.000	0.877	0.932	0.250	0.000	0.927	0.938
Cars	2	0	0	2	1	700	0	701	908	2	0	910	1613
Cars %	100.0	0.0	0.0	100.0	100.0	96.6	0.0	96.6	98.2	100.0	0.0	98.2	97.5
Heavy Vehicles	0	0	0	0	0	25	0	25	17	0	0	17	42
Heavy Vehicles %	0.0	0.0	0.0	0.0	0.0	3.4	0.0	3.4	1.8	0.0	0.0	1.8	2.5
Cars Enter Leg	2	0	0	2	1	700	0	701	908	2	0	910	1613
Heavy Enter Leg	0	0	0	0	0	25	0	25	17	0	0	17	42
Total Entering Leg	2	0	0	2	1	725	0	726	925	2	0	927	1655
Cars Exiting Leg	3				908				702				1613
Heavy Exiting Leg	0				17				25				42
Total Exiting Leg	3				925				727				1655

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**



Class: **Cars-Combined (Motorcycles, Cars, Light Goods)**

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	88	0	88	59	0	0	59	147
6:15 AM	0	0	0	0	0	127	0	127	97	0	0	97	224
6:30 AM	0	0	0	0	0	139	0	139	127	1	0	128	267
6:45 AM	0	1	0	1	0	139	0	139	200	1	0	201	341
Total	0	1	0	1	0	493	0	493	483	2	0	485	979
7:00 AM	1	0	0	1	0	132	0	132	196	0	0	196	329
7:15 AM	0	0	0	0	0	148	0	148	213	0	0	213	361
7:30 AM	0	0	0	0	0	198	0	198	225	0	0	225	423
7:45 AM	0	0	0	0	0	191	0	191	234	0	0	234	425
Total	1	0	0	1	0	669	0	669	868	0	0	868	1538
8:00 AM	0	0	0	0	0	165	0	165	202	0	0	202	367
8:15 AM	2	0	0	2	1	146	0	147	247	2	0	249	398
8:30 AM	0	0	0	0	2	174	0	176	220	1	0	221	397
8:45 AM	1	0	0	1	1	174	0	175	228	1	0	229	405
Total	3	0	0	3	4	659	0	663	897	4	0	901	1567
Grand Total	4	1	0	5	4	1821	0	1825	2248	6	0	2254	4084
Approach %	80.0	20.0	0.0		0.2	99.8	0.0		99.7	0.3	0.0		
Total %	0.1	0.0	0.0	0.1	0.1	44.6	0.0	44.7	55.0	0.1	0.0	55.2	
Exiting Leg Total	10				2249				1825				4084

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Airport Road					Marrett Road (Route 2A)				North Great Road (Route 2A)				Total	
	from North					from East				from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total		
7:30 AM	0	0	0	0		0	198	0	198	225	0	0	225	423	
7:45 AM	0	0	0	0		0	191	0	191	234	0	0	234	425	
8:00 AM	0	0	0	0		0	165	0	165	202	0	0	202	367	
8:15 AM	2	0	0	2		1	146	0	147	247	2	0	249	398	
Total Volume	2	0	0	2		1	700	0	701	908	2	0	910	1613	
% Approach Total	100.0	0.0	0.0			0.1	99.9	0.0		99.8	0.2	0.0			
PHF	0.250	0.000	0.000	0.250		0.250	0.884	0.000	0.885	0.919	0.250	0.000	0.914	0.949	
Entering Leg	2	0	0	2		1	700	0	701	908	2	0	910	1613	
Exiting Leg						3	908							702	1613
Total	5					1609				1612				3226	

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	1	0	1	1	7	0	8	3	0	0	3	12
6:15 AM	0	0	0	0	0	5	0	5	1	0	0	1	6
6:30 AM	0	0	0	0	0	6	0	6	7	0	0	7	13
6:45 AM	0	0	0	0	0	4	0	4	8	0	0	8	12
Total	0	1	0	1	1	22	0	23	19	0	0	19	43
7:00 AM	0	0	0	0	0	6	0	6	4	0	0	4	10
7:15 AM	0	0	0	0	0	8	0	8	7	0	0	7	15
7:30 AM	0	0	0	0	0	9	0	9	9	0	0	9	18
7:45 AM	0	0	0	0	0	6	0	6	3	0	0	3	9
Total	0	0	0	0	0	29	0	29	23	0	0	23	52
8:00 AM	0	0	0	0	0	5	0	5	4	0	0	4	9
8:15 AM	0	0	0	0	0	5	0	5	1	0	0	1	6
8:30 AM	0	0	0	0	0	5	0	5	4	0	0	4	9
8:45 AM	0	0	0	0	0	8	0	8	6	0	0	6	14
Total	0	0	0	0	0	23	0	23	15	0	0	15	38
Grand Total	0	1	0	1	1	74	0	75	57	0	0	57	133
Approach %	0.0	100.0	0.0		1.3	98.7	0.0		100.0	0.0	0.0		
Total %	0.0	0.8	0.0	0.8	0.8	55.6	0.0	56.4	42.9	0.0	0.0	42.9	
Exiting Leg Total	1				58				74				133
Buses	0	0	0	0	0	13	0	13	11	0	0	11	24
% Buses	0.0	0.0	0.0	0.0	0.0	17.6	0.0	17.3	19.3	0.0	0.0	19.3	18.0
Exiting Leg Total	0				11				13				24
Single-Unit Trucks	0	1	0	1	1	53	0	54	36	0	0	36	91
% Single-Unit	0.0	100.0	0.0	100.0	100.0	71.6	0.0	72.0	63.2	0.0	0.0	63.2	68.4
Exiting Leg Total	1				37				53				91
Articulated Trucks	0	0	0	0	0	8	0	8	10	0	0	10	18
% Articulated	0.0	0.0	0.0	0.0	0.0	10.8	0.0	10.7	17.5	0.0	0.0	17.5	13.5
Exiting Leg Total	0				10				8				18

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:45 AM	0	0	0	0	0	4	0	4	8	0	0	8	12
7:00 AM	0	0	0	0	0	6	0	6	4	0	0	4	10
7:15 AM	0	0	0	0	0	8	0	8	7	0	0	7	15
7:30 AM	0	0	0	0	0	9	0	9	9	0	0	9	18
Total Volume	0	0	0	0	0	27	0	27	28	0	0	28	55
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.750	0.000	0.750	0.778	0.000	0.000	0.778	0.764
Buses	0	0	0	0	0	4	0	4	5	0	0	5	9
Buses %	0.0	0.0	0.0	0.0	0.0	14.8	0.0	14.8	17.9	0.0	0.0	17.9	16.4
Single-Unit Trucks	0	0	0	0	0	18	0	18	17	0	0	17	35
Single-Unit %	0.0	0.0	0.0	0.0	0.0	66.7	0.0	66.7	60.7	0.0	0.0	60.7	63.6
Articulated Trucks	0	0	0	0	0	5	0	5	6	0	0	6	11
Articulated %	0.0	0.0	0.0	0.0	0.0	18.5	0.0	18.5	21.4	0.0	0.0	21.4	20.0
Buses	0	0	0	0	0	4	0	4	5	0	0	5	9
Single-Unit Trucks	0	0	0	0	0	18	0	18	17	0	0	17	35
Articulated Trucks	0	0	0	0	0	5	0	5	6	0	0	6	11
Total Entering Leg	0	0	0	0	0	27	0	27	28	0	0	28	55
Buses				0				5				4	9
Single-Unit Trucks				0				17				18	35
Articulated Trucks				0				6				5	11
Total Exiting Leg				0				28				27	55

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	62	0	62	56	0	0	56	118
6:15 AM	0	0	0	0	0	94	0	94	78	0	0	78	172
6:30 AM	0	0	0	0	0	112	0	112	110	1	0	111	223
6:45 AM	0	1	0	1	0	111	0	111	171	1	0	172	284
Total	0	1	0	1	0	379	0	379	415	2	0	417	797
7:00 AM	0	0	0	0	0	112	0	112	171	0	0	171	283
7:15 AM	0	0	0	0	0	122	0	122	194	0	0	194	316
7:30 AM	0	0	0	0	0	175	0	175	197	0	0	197	372
7:45 AM	0	0	0	0	0	172	0	172	223	0	0	223	395
Total	0	0	0	0	0	581	0	581	785	0	0	785	1366
8:00 AM	0	0	0	0	0	144	0	144	190	0	0	190	334
8:15 AM	2	0	0	2	1	127	0	128	233	2	0	235	365
8:30 AM	0	0	0	0	1	157	0	158	194	1	0	195	353
8:45 AM	1	0	0	1	1	159	0	160	217	1	0	218	379
Total	3	0	0	3	3	587	0	590	834	4	0	838	1431
Grand Total	3	1	0	4	3	1547	0	1550	2034	6	0	2040	3594
Approach %	75.0	25.0	0.0		0.2	99.8	0.0		99.7	0.3	0.0		
Total %	0.1	0.0	0.0	0.1	0.1	43.0	0.0	43.1	56.6	0.2	0.0	56.8	
Exiting Leg Total	9				2035				1550				3594

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:30 AM	0	0	0	0	0	175	0	175	197	0	0	197	372
7:45 AM	0	0	0	0	0	172	0	172	223	0	0	223	395
8:00 AM	0	0	0	0	0	144	0	144	190	0	0	190	334
8:15 AM	2	0	0	2	1	127	0	128	233	2	0	235	365
Total Volume	2	0	0	2	1	618	0	619	843	2	0	845	1466
% Approach Total	100.0	0.0	0.0		0.2	99.8	0.0		99.8	0.2	0.0		
PHF	0.250	0.000	0.000	0.250	0.250	0.883	0.000	0.884	0.905	0.250	0.000	0.899	0.928
Entering Leg	2	0	0	2	1	618	0	619	843	2	0	845	1466
Exiting Leg				3				843				620	1466
Total				5				1462				1465	2932

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Light Goods Vehicle

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	26	0	26	3	0	0	3	29
6:15 AM	0	0	0	0	0	33	0	33	19	0	0	19	52
6:30 AM	0	0	0	0	0	27	0	27	17	0	0	17	44
6:45 AM	0	0	0	0	0	28	0	28	29	0	0	29	57
Total	0	0	0	0	0	114	0	114	68	0	0	68	182
7:00 AM	1	0	0	1	0	20	0	20	25	0	0	25	46
7:15 AM	0	0	0	0	0	26	0	26	19	0	0	19	45
7:30 AM	0	0	0	0	0	23	0	23	28	0	0	28	51
7:45 AM	0	0	0	0	0	19	0	19	11	0	0	11	30
Total	1	0	0	1	0	88	0	88	83	0	0	83	172
8:00 AM	0	0	0	0	0	21	0	21	12	0	0	12	33
8:15 AM	0	0	0	0	0	19	0	19	14	0	0	14	33
8:30 AM	0	0	0	0	1	17	0	18	26	0	0	26	44
8:45 AM	0	0	0	0	0	15	0	15	11	0	0	11	26
Total	0	0	0	0	1	72	0	73	63	0	0	63	136
Grand Total	1	0	0	1	1	274	0	275	214	0	0	214	490
Approach %	100.0	0.0	0.0		0.4	99.6	0.0		100.0	0.0	0.0		
Total %	0.2	0.0	0.0	0.2	0.2	55.9	0.0	56.1	43.7	0.0	0.0	43.7	
Exiting Leg Total	1				214				275				490

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:15 AM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:15 AM	0	0	0	0	0	33	0	33	19	0	0	19	52
6:30 AM	0	0	0	0	0	27	0	27	17	0	0	17	44
6:45 AM	0	0	0	0	0	28	0	28	29	0	0	29	57
7:00 AM	1	0	0	1	0	20	0	20	25	0	0	25	46
Total Volume	1	0	0	1	0	108	0	108	90	0	0	90	199
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.250	0.000	0.000	0.250	0.000	0.818	0.000	0.818	0.776	0.000	0.000	0.776	0.873
Entering Leg	1	0	0	1	0	108	0	108	90	0	0	90	199
Exiting Leg				0				90				109	199
Total				1				198				199	398

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	2	0	2	1	0	0	1	3
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	0	0	0	0	0	3	0	3	3	0	0	3	6
7:00 AM	0	0	0	0	0	2	0	2	1	0	0	1	3
7:15 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:45 AM	0	0	0	0	0	1	0	1	2	0	0	2	3
Total	0	0	0	0	0	5	0	5	5	0	0	5	10
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
8:30 AM	0	0	0	0	0	2	0	2	1	0	0	1	3
8:45 AM	0	0	0	0	0	2	0	2	2	0	0	2	4
Total	0	0	0	0	0	5	0	5	3	0	0	3	8
Grand Total	0	0	0	0	0	13	0	13	11	0	0	11	24
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	54.2	0.0	54.2	45.8	0.0	0.0	45.8	
Exiting Leg Total	0				11				13				24

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:00 AM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:00 AM	0	0	0	0	0	2	0	2	1	0	0	1	3
7:15 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:45 AM	0	0	0	0	0	1	0	1	2	0	0	2	3
Total Volume	0	0	0	0	0	5	0	5	5	0	0	5	10
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.625	0.000	0.625	0.625	0.000	0.000	0.625	0.833
Entering Leg	0	0	0	0	0	5	0	5	5	0	0	5	10
Exiting Leg				0				5				5	10
Total				0				10				10	20

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	1	0	1	1	4	0	5	2	0	0	2	8
6:15 AM	0	0	0	0	0	5	0	5	1	0	0	1	6
6:30 AM	0	0	0	0	0	3	0	3	5	0	0	5	8
6:45 AM	0	0	0	0	0	3	0	3	4	0	0	4	7
Total	0	1	0	1	1	15	0	16	12	0	0	12	29
7:00 AM	0	0	0	0	0	4	0	4	3	0	0	3	7
7:15 AM	0	0	0	0	0	4	0	4	5	0	0	5	9
7:30 AM	0	0	0	0	0	7	0	7	5	0	0	5	12
7:45 AM	0	0	0	0	0	5	0	5	1	0	0	1	6
Total	0	0	0	0	0	20	0	20	14	0	0	14	34
8:00 AM	0	0	0	0	0	5	0	5	4	0	0	4	9
8:15 AM	0	0	0	0	0	4	0	4	1	0	0	1	5
8:30 AM	0	0	0	0	0	3	0	3	2	0	0	2	5
8:45 AM	0	0	0	0	0	6	0	6	3	0	0	3	9
Total	0	0	0	0	0	18	0	18	10	0	0	10	28
Grand Total	0	1	0	1	1	53	0	54	36	0	0	36	91
Approach %	0.0	100.0	0.0		1.9	98.1	0.0		100.0	0.0	0.0		
Total %	0.0	1.1	0.0	1.1	1.1	58.2	0.0	59.3	39.6	0.0	0.0	39.6	
Exiting Leg Total	1				37				53				91

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Airport Road					Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:15 AM	0	0	0	0	0	0	4	0	4	5	0	0	5	9
7:30 AM	0	0	0	0	0	0	7	0	7	5	0	0	5	12
7:45 AM	0	0	0	0	0	0	5	0	5	1	0	0	1	6
8:00 AM	0	0	0	0	0	0	5	0	5	4	0	0	4	9
Total Volume	0	0	0	0	0	0	21	0	21	15	0	0	15	36
% Approach Total	0.0	0.0	0.0			0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000		0.000	0.750	0.000	0.750	0.750	0.000	0.000	0.750	0.750
Entering Leg	0	0	0	0		0	21	0	21	15	0	0	15	36
Exiting Leg				0					15				21	36
Total				0					36				36	72

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	2	0	2	2	0	0	2	4
6:45 AM	0	0	0	0	0	1	0	1	2	0	0	2	3
Total	0	0	0	0	0	4	0	4	4	0	0	4	8
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	3	0	3	1	0	0	1	4
7:30 AM	0	0	0	0	0	1	0	1	3	0	0	3	4
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	4	0	4	4	0	0	4	8
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	0	0	0	2	0	0	2	2
Grand Total	0	0	0	0	0	8	0	8	10	0	0	10	18
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	44.4	0.0	44.4	55.6	0.0	0.0	55.6	
Exiting Leg Total	0				10				8				18

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:30 AM	0	0	0	0	0	2	0	2	2	0	0	2	4
6:45 AM	0	0	0	0	0	1	0	1	2	0	0	2	3
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	3	0	3	1	0	0	1	4
Total Volume	0	0	0	0	0	6	0	6	5	0	0	5	11
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.625	0.000	0.000	0.625	0.688
Entering Leg	0	0	0	0	0	6	0	6	5	0	0	5	11
Exiting Leg				0				5				6	11
Total				0				11				11	22

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Grand Total	0	0	0	0	0	0	0	0	2	0	0	0	2	2	0	0	0	0	2	4
Approach %	0.0	0.0	0.0	0.0	0.0			0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	50.0	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0	50.0	
Exiting Leg Total	0						2						2						4	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.500	0.500
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
Exiting Leg	0						2						2						2
Total	0						2						2						4

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0	
Total	0						0						0						0	

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	1	0	0	1	0	213	0	213	141	0	0	141	355
3:15 PM	0	0	0	0	0	215	0	215	154	0	0	154	369
3:30 PM	3	0	0	3	2	256	0	258	142	0	0	142	403
3:45 PM	0	4	0	4	2	222	0	224	157	1	0	158	386
Total	4	4	0	8	4	906	0	910	594	1	0	595	1513
4:00 PM	1	0	0	1	0	249	0	249	130	1	0	131	381
4:15 PM	0	0	0	0	0	252	0	252	143	0	0	143	395
4:30 PM	0	0	0	0	0	259	0	259	115	0	0	115	374
4:45 PM	0	0	0	0	0	297	0	297	110	0	0	110	407
Total	1	0	0	1	0	1057	0	1057	498	1	0	499	1557
5:00 PM	0	4	0	4	1	255	0	256	142	1	0	143	403
5:15 PM	0	1	0	1	0	273	0	273	119	1	0	120	394
5:30 PM	1	1	0	2	0	292	0	292	119	1	0	120	414
5:45 PM	0	2	0	2	1	249	0	250	111	0	0	111	363
Total	1	8	0	9	2	1069	0	1071	491	3	0	494	1574
Grand Total	6	12	0	18	6	3032	0	3038	1583	5	0	1588	4644
Approach %	33.3	66.7	0.0		0.2	99.8	0.0		99.7	0.3	0.0		
Total %	0.1	0.3	0.0	0.4	0.1	65.3	0.0	65.4	34.1	0.1	0.0	34.2	
Exiting Leg Total				11				1595				3038	4644
Cars	6	12	0	18	6	2990	0	2996	1545	5	0	1550	4564
% Cars	100.0	100.0	0.0	100.0	100.0	98.6	0.0	98.6	97.6	100.0	0.0	97.6	98.3
Exiting Leg Total				11				1557				2996	4564
Heavy Vehicles	0	0	0	0	0	42	0	42	38	0	0	38	80
% Heavy Vehicles	0.0	0.0	0.0	0.0	0.0	1.4	0.0	1.4	2.4	0.0	0.0	2.4	1.7
Exiting Leg Total				0				38				42	80

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:45 PM	0	0	0	0	0	297	0	297	110	0	0	110	407
5:00 PM	0	4	0	4	1	255	0	256	142	1	0	143	403
5:15 PM	0	1	0	1	0	273	0	273	119	1	0	120	394
5:30 PM	1	1	0	2	0	292	0	292	119	1	0	120	414
Total Volume	1	6	0	7	1	1117	0	1118	490	3	0	493	1618
% Approach Total	14.3	85.7	0.0		0.1	99.9	0.0		99.4	0.6	0.0		
PHF	0.250	0.375	0.000	0.438	0.250	0.940	0.000	0.941	0.863	0.750	0.000	0.862	0.977
Cars	1	6	0	7	1	1109	0	1110	477	3	0	480	1597
Cars %	100.0	100.0	0.0	100.0	100.0	99.3	0.0	99.3	97.3	100.0	0.0	97.4	98.7
Heavy Vehicles	0	0	0	0	0	8	0	8	13	0	0	13	21
Heavy Vehicles %	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7	2.7	0.0	0.0	2.6	1.3
Cars Enter Leg	1	6	0	7	1	1109	0	1110	477	3	0	480	1597
Heavy Enter Leg	0	0	0	0	0	8	0	8	13	0	0	13	21
Total Entering Leg	1	6	0	7	1	1117	0	1118	490	3	0	493	1618
Cars Exiting Leg				4				483				1110	1597
Heavy Exiting Leg				0				13				8	21
Total Exiting Leg				4				496				1118	1618

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**



Class: **Cars-Combined (Motorcycles, Cars, Light Goods)**

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	1	0	0	1	0	207	0	207	136	0	0	136	344
3:15 PM	0	0	0	0	0	208	0	208	149	0	0	149	357
3:30 PM	3	0	0	3	2	251	0	253	139	0	0	139	395
3:45 PM	0	4	0	4	2	214	0	216	156	1	0	157	377
Total	4	4	0	8	4	880	0	884	580	1	0	581	1473
4:00 PM	1	0	0	1	0	245	0	245	127	1	0	128	374
4:15 PM	0	0	0	0	0	251	0	251	140	0	0	140	391
4:30 PM	0	0	0	0	0	259	0	259	111	0	0	111	370
4:45 PM	0	0	0	0	0	294	0	294	107	0	0	107	401
Total	1	0	0	1	0	1049	0	1049	485	1	0	486	1536
5:00 PM	0	4	0	4	1	253	0	254	137	1	0	138	396
5:15 PM	0	1	0	1	0	271	0	271	115	1	0	116	388
5:30 PM	1	1	0	2	0	291	0	291	118	1	0	119	412
5:45 PM	0	2	0	2	1	246	0	247	110	0	0	110	359
Total	1	8	0	9	2	1061	0	1063	480	3	0	483	1555
Grand Total	6	12	0	18	6	2990	0	2996	1545	5	0	1550	4564
Approach %	33.3	66.7	0.0		0.2	99.8	0.0		99.7	0.3	0.0		
Total %	0.1	0.3	0.0	0.4	0.1	65.5	0.0	65.6	33.9	0.1	0.0	34.0	
Exiting Leg Total	11				1557				2996				4564

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:45 PM	0	0	0	0	0	294	0	294	107	0	0	107	401
5:00 PM	0	4	0	4	1	253	0	254	137	1	0	138	396
5:15 PM	0	1	0	1	0	271	0	271	115	1	0	116	388
5:30 PM	1	1	0	2	0	291	0	291	118	1	0	119	412
Total Volume	1	6	0	7	1	1109	0	1110	477	3	0	480	1597
% Approach Total	14.3	85.7	0.0		0.1	99.9	0.0		99.4	0.6	0.0		
PHF	0.250	0.375	0.000	0.438	0.250	0.943	0.000	0.944	0.870	0.750	0.000	0.870	0.969
Entering Leg	1	6	0	7	1	1109	0	1110	477	3	0	480	1597
Exiting Leg				4				483				1110	1597
Total				11				1593				1590	3194

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**



Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	6	0	6	5	0	0	5	11
3:15 PM	0	0	0	0	0	7	0	7	5	0	0	5	12
3:30 PM	0	0	0	0	0	5	0	5	3	0	0	3	8
3:45 PM	0	0	0	0	0	8	0	8	1	0	0	1	9
Total	0	0	0	0	0	26	0	26	14	0	0	14	40
4:00 PM	0	0	0	0	0	4	0	4	3	0	0	3	7
4:15 PM	0	0	0	0	0	1	0	1	3	0	0	3	4
4:30 PM	0	0	0	0	0	0	0	0	4	0	0	4	4
4:45 PM	0	0	0	0	0	3	0	3	3	0	0	3	6
Total	0	0	0	0	0	8	0	8	13	0	0	13	21
5:00 PM	0	0	0	0	0	2	0	2	5	0	0	5	7
5:15 PM	0	0	0	0	0	2	0	2	4	0	0	4	6
5:30 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:45 PM	0	0	0	0	0	3	0	3	1	0	0	1	4
Total	0	0	0	0	0	8	0	8	11	0	0	11	19
Grand Total	0	0	0	0	0	42	0	42	38	0	0	38	80
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	52.5	0.0	52.5	47.5	0.0	0.0	47.5	
Exiting Leg Total	0				38				42				80
Buses	0	0	0	0	0	8	0	8	18	0	0	18	26
% Buses	0.0	0.0	0.0	0.0	0.0	19.0	0.0	19.0	47.4	0.0	0.0	47.4	32.5
Exiting Leg Total	0				18				8				26
Single-Unit Trucks	0	0	0	0	0	27	0	27	18	0	0	18	45
% Single-Unit	0.0	0.0	0.0	0.0	0.0	64.3	0.0	64.3	47.4	0.0	0.0	47.4	56.3
Exiting Leg Total	0				18				27				45
Articulated Trucks	0	0	0	0	0	7	0	7	2	0	0	2	9
% Articulated	0.0	0.0	0.0	0.0	0.0	16.7	0.0	16.7	5.3	0.0	0.0	5.3	11.3
Exiting Leg Total	0				2				7				9

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	6	0	6	5	0	0	5	11
3:15 PM	0	0	0	0	0	7	0	7	5	0	0	5	12
3:30 PM	0	0	0	0	0	5	0	5	3	0	0	3	8
3:45 PM	0	0	0	0	0	8	0	8	1	0	0	1	9
Total Volume	0	0	0	0	0	26	0	26	14	0	0	14	40
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.813	0.000	0.813	0.700	0.000	0.000	0.700	0.833
Buses	0	0	0	0	0	4	0	4	5	0	0	5	9
Buses %	0.0	0.0	0.0	0.0	0.0	15.4	0.0	15.4	35.7	0.0	0.0	35.7	22.5
Single-Unit Trucks	0	0	0	0	0	20	0	20	8	0	0	8	28
Single-Unit %	0.0	0.0	0.0	0.0	0.0	76.9	0.0	76.9	57.1	0.0	0.0	57.1	70.0
Articulated Trucks	0	0	0	0	0	2	0	2	1	0	0	1	3
Articulated %	0.0	0.0	0.0	0.0	0.0	7.7	0.0	7.7	7.1	0.0	0.0	7.1	7.5
Buses	0	0	0	0	0	4	0	4	5	0	0	5	9
Single-Unit Trucks	0	0	0	0	0	20	0	20	8	0	0	8	28
Articulated Trucks	0	0	0	0	0	2	0	2	1	0	0	1	3
Total Entering Leg	0	0	0	0	0	26	0	26	14	0	0	14	40
Buses				0				5				4	9
Single-Unit Trucks				0				8				20	28
Articulated Trucks				0				1				2	3
Total Exiting Leg				0				14				26	40

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	1	0	0	1	0	181	0	181	121	0	0	121	303
3:15 PM	0	0	0	0	0	187	0	187	132	0	0	132	319
3:30 PM	3	0	0	3	2	226	0	228	128	0	0	128	359
3:45 PM	0	4	0	4	2	195	0	197	144	1	0	145	346
Total	4	4	0	8	4	789	0	793	525	1	0	526	1327
4:00 PM	1	0	0	1	0	220	0	220	117	1	0	118	339
4:15 PM	0	0	0	0	0	229	0	229	128	0	0	128	357
4:30 PM	0	0	0	0	0	245	0	245	98	0	0	98	343
4:45 PM	0	0	0	0	0	275	0	275	101	0	0	101	376
Total	1	0	0	1	0	969	0	969	444	1	0	445	1415
5:00 PM	0	4	0	4	1	244	0	245	124	1	0	125	374
5:15 PM	0	1	0	1	0	257	0	257	111	1	0	112	370
5:30 PM	0	1	0	1	0	280	0	280	109	0	0	109	390
5:45 PM	0	1	0	1	1	236	0	237	97	0	0	97	335
Total	0	7	0	7	2	1017	0	1019	441	2	0	443	1469
Grand Total	5	11	0	16	6	2775	0	2781	1410	4	0	1414	4211
Approach %	31.3	68.8	0.0		0.2	99.8	0.0		99.7	0.3	0.0		
Total %	0.1	0.3	0.0	0.4	0.1	65.9	0.0	66.0	33.5	0.1	0.0	33.6	
Exiting Leg Total	10				1421				2780				4211

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Airport Road					Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:45 PM	0	0	0	0	0	0	275	0	275	101	0	0	101	376
5:00 PM	0	4	0	4		1	244	0	245	124	1	0	125	374
5:15 PM	0	1	0	1		0	257	0	257	111	1	0	112	370
5:30 PM	0	1	0	1		0	280	0	280	109	0	0	109	390
Total Volume	0	6	0	6		1	1056	0	1057	445	2	0	447	1510
% Approach Total	0.0	100.0	0.0			0.1	99.9	0.0		99.6	0.4	0.0		
PHF	0.000	0.375	0.000	0.375		0.250	0.943	0.000	0.944	0.897	0.500	0.000	0.894	0.968
Entering Leg	0	6	0	6		1	1056	0	1057	445	2	0	447	1510
Exiting Leg				3					451				1056	1510
Total				9					1508				1503	3020

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Light Goods Vehicle

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	26	0	26	15	0	0	15	41
3:15 PM	0	0	0	0	0	21	0	21	17	0	0	17	38
3:30 PM	0	0	0	0	0	25	0	25	11	0	0	11	36
3:45 PM	0	0	0	0	0	19	0	19	12	0	0	12	31
Total	0	0	0	0	0	91	0	91	55	0	0	55	146
4:00 PM	0	0	0	0	0	25	0	25	10	0	0	10	35
4:15 PM	0	0	0	0	0	22	0	22	12	0	0	12	34
4:30 PM	0	0	0	0	0	14	0	14	13	0	0	13	27
4:45 PM	0	0	0	0	0	19	0	19	6	0	0	6	25
Total	0	0	0	0	0	80	0	80	41	0	0	41	121
5:00 PM	0	0	0	0	0	9	0	9	13	0	0	13	22
5:15 PM	0	0	0	0	0	14	0	14	4	0	0	4	18
5:30 PM	1	0	0	1	0	11	0	11	9	1	0	10	22
5:45 PM	0	1	0	1	0	10	0	10	13	0	0	13	24
Total	1	1	0	2	0	44	0	44	39	1	0	40	86
Grand Total	1	1	0	2	0	215	0	215	135	1	0	136	353
Approach %	50.0	50.0	0.0		0.0	100.0	0.0		99.3	0.7	0.0		
Total %	0.3	0.3	0.0	0.6	0.0	60.9	0.0	60.9	38.2	0.3	0.0	38.5	
Exiting Leg Total				1				136				216	353

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Airport Road					Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	26	0	26	15	0	0	15	41
3:15 PM	0	0	0	0	0	0	21	0	21	17	0	0	17	38
3:30 PM	0	0	0	0	0	0	25	0	25	11	0	0	11	36
3:45 PM	0	0	0	0	0	0	19	0	19	12	0	0	12	31
Total Volume	0	0	0	0	0	0	91	0	91	55	0	0	55	146
% Approach Total	0.0	0.0	0.0			0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000		0.000	0.875	0.000	0.875	0.809	0.000	0.000	0.809	0.890
Entering Leg	0	0	0	0		0	91	0	91	55	0	0	55	146
Exiting Leg				0					55				91	146
Total				0					146				146	292

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	3	0	3	2	0	0	2	5
3:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
3:30 PM	0	0	0	0	0	0	0	0	2	0	0	2	2
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	4	0	4	5	0	0	5	9
4:00 PM	0	0	0	0	0	1	0	1	2	0	0	2	3
4:15 PM	0	0	0	0	0	0	0	0	3	0	0	3	3
4:30 PM	0	0	0	0	0	0	0	0	3	0	0	3	3
4:45 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
Total	0	0	0	0	0	2	0	2	9	0	0	9	11
5:00 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:15 PM	0	0	0	0	0	0	0	0	2	0	0	2	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
Total	0	0	0	0	0	2	0	2	4	0	0	4	6
Grand Total	0	0	0	0	0	8	0	8	18	0	0	18	26
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	30.8	0.0	30.8	69.2	0.0	0.0	69.2	
Exiting Leg Total	0				18				8				26

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:00 PM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:00 PM	0	0	0	0	0	1	0	1	2	0	0	2	3
4:15 PM	0	0	0	0	0	0	0	0	3	0	0	3	3
4:30 PM	0	0	0	0	0	0	0	0	3	0	0	3	3
4:45 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
Total Volume	0	0	0	0	0	2	0	2	9	0	0	9	11
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.750	0.000	0.000	0.750	0.917
Entering Leg	0	0	0	0	0	2	0	2	9	0	0	9	11
Exiting Leg				0				9				2	11
Total				0				11				11	22

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	3	0	3	2	0	0	2	5
3:15 PM	0	0	0	0	0	6	0	6	4	0	0	4	10
3:30 PM	0	0	0	0	0	5	0	5	1	0	0	1	6
3:45 PM	0	0	0	0	0	6	0	6	1	0	0	1	7
Total	0	0	0	0	0	20	0	20	8	0	0	8	28
4:00 PM	0	0	0	0	0	3	0	3	1	0	0	1	4
4:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
4:45 PM	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	0	0	0	0	0	4	0	4	4	0	0	4	8
5:00 PM	0	0	0	0	0	0	0	0	4	0	0	4	4
5:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:30 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total	0	0	0	0	0	3	0	3	6	0	0	6	9
Grand Total	0	0	0	0	0	27	0	27	18	0	0	18	45
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	60.0	0.0	60.0	40.0	0.0	0.0	40.0	
Exiting Leg Total	0				18				27				45

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	3	0	3	2	0	0	2	5
3:15 PM	0	0	0	0	0	6	0	6	4	0	0	4	10
3:30 PM	0	0	0	0	0	5	0	5	1	0	0	1	6
3:45 PM	0	0	0	0	0	6	0	6	1	0	0	1	7
Total Volume	0	0	0	0	0	20	0	20	8	0	0	8	28
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.833	0.000	0.833	0.500	0.000	0.000	0.500	0.700
Entering Leg	0	0	0	0	0	20	0	20	8	0	0	8	28
Exiting Leg				0				8				20	28
Total				0				28				28	56

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	2	0	2	0	0	0	0	2
Total	0	0	0	0	0	2	0	2	1	0	0	1	3
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	2	0	2	0	0	0	0	2
Total	0	0	0	0	0	2	0	2	0	0	0	0	2
5:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
5:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total	0	0	0	0	0	3	0	3	1	0	0	1	4
Grand Total	0	0	0	0	0	7	0	7	2	0	0	2	9
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	77.8	0.0	77.8	22.2	0.0	0.0	22.2	
Exiting Leg Total	0				2				7				9

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Airport Road				Marrett Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	2	0	2	0	0	0	0	2
5:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
5:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
Total Volume	0	0	0	0	0	4	0	4	1	0	0	1	5
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.250	0.000	0.000	0.250	0.625
Entering Leg	0	0	0	0	0	4	0	4	1	0	0	1	5
Exiting Leg				0				1				4	5
Total				0				5				5	10

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	2
Grand Total	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	3
Approach %	0.0	0.0	0.0	0.0	0.0			0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	0						0						3						3	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	2
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.500
Entering Leg	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	2
Exiting Leg	0						0						2						2
Total	0						2						2						4

PDI File #: **176038 D**
 Location: **N: Airport Road**
 Location: **E: Marrett Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Airport Road						Marrett Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0	
Total	0						0						0						0	

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	3	1	0	4	0	0	0	0	0	0	18	15	0	33	9	13	0	0	22	59
6:15 AM	0	3	0	0	3	0	0	0	0	0	0	20	14	0	34	8	29	2	0	39	76
6:30 AM	0	6	0	0	6	2	5	0	0	7	0	6	24	0	30	12	41	4	0	57	100
6:45 AM	0	3	0	0	3	0	2	0	0	2	0	12	19	1	32	24	60	2	0	86	123
Total	0	15	1	0	16	2	7	0	0	9	0	56	72	1	129	53	143	8	0	204	358
7:00 AM	2	4	0	0	6	3	1	0	0	4	0	9	11	0	20	25	55	8	0	88	118
7:15 AM	0	3	0	0	3	0	1	0	0	1	0	7	23	0	30	34	63	4	0	101	135
7:30 AM	1	8	0	0	9	1	5	0	0	6	0	9	30	0	39	29	54	1	0	84	138
7:45 AM	1	5	0	0	6	1	5	0	0	6	0	10	38	0	48	23	60	2	0	85	145
Total	4	20	0	0	24	5	12	0	0	17	0	35	102	0	137	111	232	15	0	358	536
8:00 AM	0	1	1	0	2	1	1	0	0	2	4	7	29	0	40	34	42	6	0	82	126
8:15 AM	3	3	3	0	9	1	2	1	0	4	7	11	35	1	54	27	48	5	1	81	148
8:30 AM	4	2	0	0	6	1	4	0	0	5	0	5	31	0	36	30	41	3	0	74	121
8:45 AM	2	4	1	0	7	2	10	0	0	12	0	8	51	0	59	19	48	11	0	78	156
Total	9	10	5	0	24	5	17	1	0	23	11	31	146	1	189	110	179	25	1	315	551
Grand Total	13	45	6	0	64	12	36	1	0	49	11	122	320	2	455	274	554	48	1	877	1445
Approach %	20.3	70.3	9.4	0.0		24.5	73.5	2.0	0.0		2.4	26.8	70.3	0.4		31.2	63.2	5.5	0.1		
Total %	0.9	3.1	0.4	0.0	4.4	0.8	2.5	0.1	0.0	3.4	0.8	8.4	22.1	0.1	31.5	19.0	38.3	3.3	0.1	60.7	
Exiting Leg Total	182					571					322					370					1445
Cars	11	36	6	0	53	10	34	1	0	45	11	112	315	2	440	268	553	48	1	870	1408
% Cars	84.6	80.0	100.0	0.0	82.8	83.3	94.4	100.0	0.0	91.8	100.0	91.8	98.4	100.0	96.7	97.8	99.8	100.0	100.0	99.2	97.4
Exiting Leg Total	170					570					307					361					1408
Heavy Vehicles	2	9	0	0	11	2	2	0	0	4	0	10	5	0	15	6	1	0	0	7	37
% Heavy Vehicles	15.4	20.0	0.0	0.0	17.2	16.7	5.6	0.0	0.0	8.2	0.0	8.2	1.6	0.0	3.3	2.2	0.2	0.0	0.0	0.8	2.6
Exiting Leg Total	12					1					15					9					37

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	1	8	0	0	9	1	5	0	0	6	0	9	30	0	39	29	54	1	0	84	138
7:45 AM	1	5	0	0	6	1	5	0	0	6	0	10	38	0	48	23	60	2	0	85	145
8:00 AM	0	1	1	0	2	1	1	0	0	2	4	7	29	0	40	34	42	6	0	82	126
8:15 AM	3	3	3	0	9	1	2	1	0	4	7	11	35	1	54	27	48	5	1	81	148
Total Volume	5	17	4	0	26	4	13	1	0	18	11	37	132	1	181	113	204	14	1	332	557
% Approach Total	19.2	65.4	15.4	0.0		22.2	72.2	5.6	0.0		6.1	20.4	72.9	0.6		34.0	61.4	4.2	0.3		
PHF	0.417	0.531	0.333	0.000	0.722	1.000	0.650	0.250	0.000	0.750	0.393	0.841	0.868	0.250	0.838	0.831	0.850	0.583	0.250	0.976	0.941
Cars	3	15	4	0	22	3	12	1	0	16	11	33	132	1	177	112	203	14	1	330	545
Cars %	60.0	88.2	100.0	0.0	84.6	75.0	92.3	100.0	0.0	88.9	100.0	89.2	100.0	100.0	97.8	99.1	99.5	100.0	100.0	99.4	97.8
Heavy Vehicles	2	2	0	0	4	1	1	0	0	2	0	4	0	0	4	1	1	0	0	2	12
Heavy Vehicles %	40.0	11.8	0.0	0.0	15.4	25.0	7.7	0.0	0.0	11.1	0.0	10.8	0.0	0.0	2.2	0.9	0.5	0.0	0.0	0.6	2.2
Cars Enter Leg	3	15	4	0	22	3	12	1	0	16	11	33	132	1	177	112	203	14	1	330	545
Heavy Enter Leg	2	2	0	0	4	1	1	0	0	2	0	4	0	0	4	1	1	0	0	2	12
Total Entering Leg	5	17	4	0	26	4	13	1	0	18	11	37	132	1	181	113	204	14	1	332	557
Cars Exiting Leg	50					218					129					148					545
Heavy Exiting Leg	5					1					3					3					12
Total Exiting Leg	55					219					132					151					557

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	2	1	0	3	0	0	0	0	0	0	16	15	0	31	9	13	0	0	22	56
6:15 AM	0	3	0	0	3	0	0	0	0	0	0	20	14	0	34	8	29	2	0	39	76
6:30 AM	0	6	0	0	6	2	4	0	0	6	0	5	23	0	28	11	41	4	0	56	96
6:45 AM	0	1	0	0	1	0	2	0	0	2	0	11	18	1	30	23	60	2	0	85	118
Total	0	12	1	0	13	2	6	0	0	8	0	52	70	1	123	51	143	8	0	202	346
7:00 AM	2	3	0	0	5	2	1	0	0	3	0	8	11	0	19	25	55	8	0	88	115
7:15 AM	0	2	0	0	2	0	1	0	0	1	0	7	22	0	29	32	63	4	0	99	131
7:30 AM	1	8	0	0	9	1	5	0	0	6	0	8	30	0	38	29	54	1	0	84	137
7:45 AM	0	4	0	0	4	1	5	0	0	6	0	9	38	0	47	23	59	2	0	84	141
Total	3	17	0	0	20	4	12	0	0	16	0	32	101	0	133	109	231	15	0	355	524
8:00 AM	0	1	1	0	2	0	1	0	0	1	4	7	29	0	40	33	42	6	0	81	124
8:15 AM	2	2	3	0	7	1	1	1	0	3	7	9	35	1	52	27	48	5	1	81	143
8:30 AM	4	1	0	0	5	1	4	0	0	5	0	5	30	0	35	30	41	3	0	74	119
8:45 AM	2	3	1	0	6	2	10	0	0	12	0	7	50	0	57	18	48	11	0	77	152
Total	8	7	5	0	20	4	16	1	0	21	11	28	144	1	184	108	179	25	1	313	538
Grand Total	11	36	6	0	53	10	34	1	0	45	11	112	315	2	440	268	553	48	1	870	1408
Approach %	20.8	67.9	11.3	0.0		22.2	75.6	2.2	0.0		2.5	25.5	71.6	0.5		30.8	63.6	5.5	0.1		
Total %	0.8	2.6	0.4	0.0	3.8	0.7	2.4	0.1	0.0	3.2	0.8	8.0	22.4	0.1	31.3	19.0	39.3	3.4	0.1	61.8	
Exiting Leg Total	170					570					307					361					1408

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	1	8	0	0	9	1	5	0	0	6	0	8	30	0	38	29	54	1	0	84	137
7:45 AM	0	4	0	0	4	1	5	0	0	6	0	9	38	0	47	23	59	2	0	84	141
8:00 AM	0	1	1	0	2	0	1	0	0	1	4	7	29	0	40	33	42	6	0	81	124
8:15 AM	2	2	3	0	7	1	1	1	0	3	7	9	35	1	52	27	48	5	1	81	143
Total Volume	3	15	4	0	22	3	12	1	0	16	11	33	132	1	177	112	203	14	1	330	545
% Approach Total	13.6	68.2	18.2	0.0		18.8	75.0	6.3	0.0		6.2	18.6	74.6	0.6		33.9	61.5	4.2	0.3		
PHF	0.375	0.469	0.333	0.000	0.611	0.750	0.600	0.250	0.000	0.667	0.393	0.917	0.868	0.250	0.851	0.848	0.860	0.583	0.250	0.982	0.953
Entering Leg	3	15	4	0	22	3	12	1	0	16	11	33	132	1	177	112	203	14	1	330	545
Exiting Leg	50					218					129					148					545
Total	72					234					306					478					1090

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	1	0	0	1	0	1	1	0	2	1	0	0	0	1	4
6:45 AM	0	2	0	0	2	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	5
Total	0	3	0	0	3	0	1	0	0	1	0	4	2	0	6	2	0	0	0	2	12
7:00 AM	0	1	0	0	1	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	3
7:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	2	0	0	0	2	4
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
7:45 AM	1	1	0	0	2	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	4
Total	1	3	0	0	4	1	0	0	0	1	0	3	1	0	4	2	1	0	0	3	12
8:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	2
8:15 AM	1	1	0	0	2	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	5
8:30 AM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
8:45 AM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
Total	1	3	0	0	4	1	1	0	0	2	0	3	2	0	5	2	0	0	0	2	13
Grand Total	2	9	0	0	11	2	2	0	0	4	0	10	5	0	15	6	1	0	0	7	37
Approach %	18.2	81.8	0.0	0.0		50.0	50.0	0.0	0.0		0.0	66.7	33.3	0.0		85.7	14.3	0.0	0.0		
Total %	5.4	24.3	0.0	0.0	29.7	5.4	5.4	0.0	0.0	10.8	0.0	27.0	13.5	0.0	40.5	16.2	2.7	0.0	0.0	18.9	
Exiting Leg Total	12					1					15					9					37
Buses	0	6	0	0	6	0	0	0	0	0	0	6	4	0	10	4	0	0	0	4	20
% Buses	0.0	66.7	0.0	0.0	54.5	0.0	0.0	0.0	0.0	0.0	0.0	60.0	80.0	0.0	66.7	66.7	0.0	0.0	0.0	57.1	54.1
Exiting Leg Total	6					0					10					4					20
Single-Unit Trucks	2	3	0	0	5	2	2	0	0	4	0	4	0	0	4	2	1	0	0	3	16
% Single-Unit	100.0	33.3	0.0	0.0	45.5	100.0	100.0	0.0	0.0	100.0	0.0	40.0	0.0	0.0	26.7	33.3	100.0	0.0	0.0	42.9	43.2
Exiting Leg Total	6					1					5					4					16
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
% Articulated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	2.7
Exiting Leg Total	0					0					0					1					1

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:30 AM	0	0	0	0	0	0	1	0	0	1	0	1	1	0	2	1	0	0	0	1	4
6:45 AM	0	2	0	0	2	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	5
7:00 AM	0	1	0	0	1	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	3
7:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	2	0	0	0	2	4
Total Volume	0	4	0	0	4	1	1	0	0	2	0	3	3	0	6	4	0	0	0	4	16
% Approach Total	0.0	100.0	0.0	0.0		50.0	50.0	0.0	0.0		0.0	50.0	50.0	0.0		100.0	0.0	0.0	0.0		
PHF	0.000	0.500	0.000	0.000	0.500	0.250	0.250	0.000	0.000	0.500	0.000	0.750	0.750	0.000	0.750	0.500	0.000	0.000	0.000	0.500	0.800
Buses	0	2	0	0	2	0	0	0	0	0	0	2	2	0	4	3	0	0	0	3	9
Buses %	0.0	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7	66.7	0.0	66.7	75.0	0.0	0.0	0.0	75.0	56.3
Single-Unit Trucks	0	2	0	0	2	1	1	0	0	2	0	1	0	0	1	1	0	0	0	1	6
Single-Unit %	0.0	50.0	0.0	0.0	50.0	100.0	100.0	0.0	0.0	100.0	0.0	33.3	0.0	0.0	16.7	25.0	0.0	0.0	0.0	25.0	37.5
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	16.7	0.0	0.0	0.0	0.0	0.0	6.3
Buses	0	2	0	0	2	0	0	0	0	0	0	2	2	0	4	3	0	0	0	3	9
Single-Unit Trucks	0	2	0	0	2	1	1	0	0	2	0	1	0	0	1	1	0	0	0	1	6
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Total Entering Leg	0	4	0	0	4	1	1	0	0	2	0	3	3	0	6	4	0	0	0	4	16
Buses	2					0					5					2					9
Single-Unit Trucks	2					0					3					1					6
Articulated Trucks	0					0					0					1					1
Total Exiting Leg	4					0					8					4					16

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	2	1	0	3	0	0	0	0	0	0	12	12	0	24	9	9	0	0	18	45
6:15 AM	0	2	0	0	2	0	0	0	0	0	0	14	11	0	25	8	22	2	0	32	59
6:30 AM	0	5	0	0	5	2	4	0	0	6	0	4	17	0	21	10	32	3	0	45	77
6:45 AM	0	0	0	0	0	0	2	0	0	2	0	9	17	1	27	22	55	2	0	79	108
Total	0	9	1	0	10	2	6	0	0	8	0	39	57	1	97	49	118	7	0	174	289
7:00 AM	1	3	0	0	4	2	1	0	0	3	0	6	9	0	15	24	49	7	0	80	102
7:15 AM	0	2	0	0	2	0	1	0	0	1	0	6	20	0	26	30	57	3	0	90	119
7:30 AM	1	6	0	0	7	1	4	0	0	5	0	7	30	0	37	28	50	1	0	79	128
7:45 AM	0	3	0	0	3	1	5	0	0	6	0	8	38	0	46	23	58	2	0	83	138
Total	2	14	0	0	16	4	11	0	0	15	0	27	97	0	124	105	214	13	0	332	487
8:00 AM	0	1	1	0	2	0	0	0	0	0	4	5	28	0	37	33	38	5	0	76	115
8:15 AM	1	2	3	0	6	1	1	0	0	2	7	7	32	1	47	27	47	5	0	79	134
8:30 AM	3	1	0	0	4	1	4	0	0	5	0	5	30	0	35	26	38	3	0	67	111
8:45 AM	1	3	0	0	4	1	10	0	0	11	0	7	49	0	56	18	45	7	0	70	141
Total	5	7	4	0	16	3	15	0	0	18	11	24	139	1	175	104	168	20	0	292	501
Grand Total	7	30	5	0	42	9	32	0	0	41	11	90	293	2	396	258	500	40	0	798	1277
Approach %	16.7	71.4	11.9	0.0		22.0	78.0	0.0	0.0		2.8	22.7	74.0	0.5		32.3	62.7	5.0	0.0		
Total %	0.5	2.3	0.4	0.0	3.3	0.7	2.5	0.0	0.0	3.2	0.9	7.0	22.9	0.2	31.0	20.2	39.2	3.1	0.0	62.5	
Exiting Leg Total	139					516					290					332					1277

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	1	6	0	0	7	1	4	0	0	5	0	7	30	0	37	28	50	1	0	79	128
7:45 AM	0	3	0	0	3	1	5	0	0	6	0	8	38	0	46	23	58	2	0	83	138
8:00 AM	0	1	1	0	2	0	0	0	0	0	4	5	28	0	37	33	38	5	0	76	115
8:15 AM	1	2	3	0	6	1	1	0	0	2	7	7	32	1	47	27	47	5	0	79	134
Total Volume	2	12	4	0	18	3	10	0	0	13	11	27	128	1	167	111	193	13	0	317	515
% Approach Total	11.1	66.7	22.2	0.0		23.1	76.9	0.0	0.0		6.6	16.2	76.6	0.6		35.0	60.9	4.1	0.0		
PHF	0.500	0.500	0.333	0.000	0.643	0.750	0.500	0.000	0.000	0.542	0.393	0.844	0.842	0.250	0.888	0.841	0.832	0.650	0.000	0.955	0.933
Entering Leg	2	12	4	0	18	3	10	0	0	13	11	27	128	1	167	111	193	13	0	317	515
Exiting Leg	43					208					124					140					515
Total	61					221					291					457					1030

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Light Goods Vehicle**



	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	4	3	0	7	0	4	0	0	4	11
6:15 AM	0	1	0	0	1	0	0	0	0	0	0	6	3	0	9	0	7	0	0	7	17
6:30 AM	0	1	0	0	1	0	0	0	0	0	0	1	6	0	7	1	9	1	0	11	19
6:45 AM	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	1	5	0	0	6	10
Total	0	3	0	0	3	0	0	0	0	0	0	13	13	0	26	2	25	1	0	28	57
7:00 AM	1	0	0	0	1	0	0	0	0	0	0	2	2	0	4	1	6	1	0	8	13
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3	2	6	1	0	9	12
7:30 AM	0	2	0	0	2	0	1	0	0	1	0	1	0	0	1	1	4	0	0	5	9
7:45 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	3
Total	1	3	0	0	4	0	1	0	0	1	0	5	4	0	9	4	17	2	0	23	37
8:00 AM	0	0	0	0	0	0	1	0	0	1	0	2	1	0	3	0	4	1	0	5	9
8:15 AM	1	0	0	0	1	0	0	1	0	1	0	2	3	0	5	0	1	0	1	2	9
8:30 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4	3	0	0	7	8
8:45 AM	1	0	1	0	2	1	0	0	0	1	0	0	1	0	1	0	3	4	0	7	11
Total	3	0	1	0	4	1	1	1	0	3	0	4	5	0	9	4	11	5	1	21	37
Grand Total	4	6	1	0	11	1	2	1	0	4	0	22	22	0	44	10	53	8	1	72	131
Approach %	36.4	54.5	9.1	0.0		25.0	50.0	25.0	0.0		0.0	50.0	50.0	0.0		13.9	73.6	11.1	1.4		
Total %	3.1	4.6	0.8	0.0	8.4	0.8	1.5	0.8	0.0	3.1	0.0	16.8	16.8	0.0	33.6	7.6	40.5	6.1	0.8	55.0	
Exiting Leg Total	31					54					17					29					131

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:15 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:15 AM	0	1	0	0	1	0	0	0	0	0	0	6	3	0	9	0	7	0	0	7	17
6:30 AM	0	1	0	0	1	0	0	0	0	0	0	1	6	0	7	1	9	1	0	11	19
6:45 AM	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	1	5	0	0	6	10
7:00 AM	1	0	0	0	1	0	0	0	0	0	0	2	2	0	4	1	6	1	0	8	13
Total Volume	1	3	0	0	4	0	0	0	0	0	0	11	12	0	23	3	27	2	0	32	59
% Approach Total	25.0	75.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	47.8	52.2	0.0		9.4	84.4	6.3	0.0		
PHF	0.250	0.750	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.458	0.500	0.000	0.639	0.750	0.750	0.500	0.000	0.727	0.776
Entering Leg	1	3	0	0	4	0	0	0	0	0	0	11	12	0	23	3	27	2	0	32	59
Exiting Leg	13					27					6					13					59
Total	17					27					29					45					118

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
Total	0	2	0	0	2	0	0	0	0	0	0	2	1	0	3	1	0	0	0	1	6
7:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	2	3
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
Total	0	2	0	0	2	0	0	0	0	0	0	2	1	0	3	2	0	0	0	2	7
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
8:45 AM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
Total	0	2	0	0	2	0	0	0	0	0	0	2	2	0	4	1	0	0	0	1	7
Grand Total	0	6	0	0	6	0	0	0	0	0	0	6	4	0	10	4	0	0	0	4	20
Approach %	0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	60.0	40.0	0.0		100.0	0.0	0.0	0.0		
Total %	0.0	30.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	20.0	0.0	50.0	20.0	0.0	0.0	0.0	20.0	
Exiting Leg Total	6					0					10					4					20

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
7:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	2	3
Total Volume	0	2	0	0	2	0	0	0	0	0	0	2	2	0	4	3	0	0	0	3	9
% Approach Total	0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	50.0	50.0	0.0		100.0	0.0	0.0	0.0		
PHF	0.000	0.500	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.500	0.000	0.500	0.375	0.000	0.000	0.000	0.375	0.563
Entering Leg	0	2	0	0	2	0	0	0	0	0	0	2	2	0	4	3	0	0	0	3	9
Exiting Leg	2					0					5					2					9
Total	4					0					9					5					18

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	1	0	0	0	1	3
6:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	1	0	0	1	0	2	0	0	2	1	0	0	0	1	5
7:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
7:45 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
Total	1	1	0	0	2	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	5
8:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	2
8:15 AM	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	3
8:30 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	1	0	0	2	1	1	0	0	2	0	1	0	0	1	1	0	0	0	1	6
Grand Total	2	3	0	0	5	2	2	0	0	4	0	4	0	0	4	2	1	0	0	3	16
Approach %	40.0	60.0	0.0	0.0		50.0	50.0	0.0	0.0		0.0	100.0	0.0	0.0		66.7	33.3	0.0	0.0		
Total %	12.5	18.8	0.0	0.0	31.3	12.5	12.5	0.0	0.0	25.0	0.0	25.0	0.0	0.0	25.0	12.5	6.3	0.0	0.0	18.8	
Exiting Leg Total	6					1					5					4					16

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
7:45 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
8:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	2
8:15 AM	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	3
Total Volume	2	0	0	0	2	1	1	0	0	2	0	2	0	0	2	1	1	0	0	2	8
% Approach Total	100.0	0.0	0.0	0.0		50.0	50.0	0.0	0.0		0.0	100.0	0.0	0.0		50.0	50.0	0.0	0.0		
PHF	0.500	0.000	0.000	0.000	0.500	0.250	0.250	0.000	0.000	0.500	0.000	0.500	0.000	0.000	0.500	0.250	0.250	0.000	0.000	0.500	0.667
Entering Leg	2	0	0	0	2	1	1	0	0	2	0	2	0	0	2	1	1	0	0	2	8
Exiting Leg					3					1					1					3	8
Total					5					3					3					5	16

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Approach %	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	0					0					0					1					1

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
% Approach Total	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.250
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Exiting Leg	0					0					0					1					1
Total	0					0					1					1					2

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	1	1	0	0	0	0	2	4
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0	0.0	0.0		50.0	50.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	25.0	0.0	0.0	0.0	25.0	25.0	25.0	0.0	0.0	0.0	0.0	50.0	
Exiting Leg Total	0							1							1							2							4

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:15 AM	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total	
	from North							from East							from South							from West								
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2	
Total Volume	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	1	1	0	0	0	0	2	4
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0	0.0	0.0		50.0	50.0	0.0	0.0	0.0	0.0			
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.250	0.250	0.000	0.000	0.000	0.000	0.250	0.500	
Entering Leg	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	1	1	0	0	0	0	2	4	
Exiting Leg	0							1							1							2							4	
Total	0							2							2							4							8	

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Approach %	0	0	0	0	100	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total %	0	0	0	0	100	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Exiting Leg Total	1							0							0							0							1

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Approach Total	0.0	0.0	0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	
Entering Leg	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Exiting Leg	1							0							0							0							1
Total	2							0							0							0							2

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	5	12	0	0	17	1	25	0	0	26	0	9	20	0	29	28	1	0	0	29	101
3:15 PM	0	13	0	0	13	1	32	1	0	34	0	17	19	0	36	29	0	0	0	29	112
3:30 PM	3	19	1	0	23	1	25	0	0	26	0	9	21	0	30	38	7	0	0	45	124
3:45 PM	4	15	0	0	19	1	48	0	0	49	0	4	22	0	26	31	4	2	0	37	131
Total	12	59	1	0	72	4	130	1	0	135	0	39	82	0	121	126	12	2	0	140	468
4:00 PM	9	6	1	0	16	0	55	1	0	56	0	7	23	0	30	47	3	1	0	51	153
4:15 PM	2	12	0	0	14	0	58	0	0	58	0	3	28	0	31	29	3	1	0	33	136
4:30 PM	3	4	0	1	8	0	47	0	0	47	0	2	28	0	30	39	3	1	0	43	128
4:45 PM	3	5	0	0	8	2	48	0	0	50	0	1	29	0	30	39	2	0	0	41	129
Total	17	27	1	1	46	2	208	1	0	211	0	13	108	0	121	154	11	3	0	168	546
5:00 PM	8	10	0	0	18	1	48	0	0	49	0	8	21	0	29	39	5	0	0	44	140
5:15 PM	6	7	1	0	14	3	38	1	0	42	0	5	13	0	18	34	2	0	0	36	110
5:30 PM	3	3	0	0	6	4	28	0	0	32	0	2	31	0	33	40	2	0	0	42	113
5:45 PM	3	10	2	0	15	1	34	1	0	36	0	7	18	0	25	21	0	0	0	21	97
Total	20	30	3	0	53	9	148	2	0	159	0	22	83	0	105	134	9	0	0	143	460
Grand Total	49	116	5	1	171	15	486	4	0	505	0	74	273	0	347	414	32	5	0	451	1474
Approach %	28.7	67.8	2.9	0.6		3.0	96.2	0.8	0.0		0.0	21.3	78.7	0.0		91.8	7.1	1.1	0.0		
Total %	3.3	7.9	0.3	0.1	11.6	1.0	33.0	0.3	0.0	34.3	0.0	5.0	18.5	0.0	23.5	28.1	2.2	0.3	0.0	30.6	
Exiting Leg Total	95					37					534					808					1474
Cars	49	110	4	1	164	15	484	3	0	502	0	67	271	0	338	410	30	5	0	445	1449
% Cars	100.0	94.8	80.0	100.0	95.9	100.0	99.6	75.0	0.0	99.4	0.0	90.5	99.3	0.0	97.4	99.0	93.8	100.0	0.0	98.7	98.3
Exiting Leg Total	88					34					523					804					1449
Heavy Vehicles	0	6	1	0	7	0	2	1	0	3	0	7	2	0	9	4	2	0	0	6	25
% Heavy Vehicles	0.0	5.2	20.0	0.0	4.1	0.0	0.4	25.0	0.0	0.6	0.0	9.5	0.7	0.0	2.6	1.0	6.3	0.0	0.0	1.3	1.7
Exiting Leg Total	7					3					11					4					25

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:45 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:45 PM	4	15	0	0	19	1	48	0	0	49	0	4	22	0	26	31	4	2	0	37	131
4:00 PM	9	6	1	0	16	0	55	1	0	56	0	7	23	0	30	47	3	1	0	51	153
4:15 PM	2	12	0	0	14	0	58	0	0	58	0	3	28	0	31	29	3	1	0	33	136
4:30 PM	3	4	0	1	8	0	47	0	0	47	0	2	28	0	30	39	3	1	0	43	128
Total Volume	18	37	1	1	57	1	208	1	0	210	0	16	101	0	117	146	13	5	0	164	548
% Approach Total	31.6	64.9	1.8	1.8		0.5	99.0	0.5	0.0		0.0	13.7	86.3	0.0		89.0	7.9	3.0	0.0		
PHF	0.500	0.617	0.250	0.250	0.750	0.250	0.897	0.250	0.000	0.905	0.000	0.571	0.902	0.000	0.944	0.777	0.813	0.625	0.000	0.804	0.895
Cars	18	35	1	1	55	1	207	1	0	209	0	14	101	0	115	146	12	5	0	163	542
Cars %	100.0	94.6	100.0	100.0	96.5	100.0	99.5	100.0	0.0	99.5	0.0	87.5	100.0	0.0	98.3	100.0	92.3	100.0	0.0	99.4	98.9
Heavy Vehicles	0	2	0	0	2	0	1	0	0	1	0	2	0	0	2	0	1	0	0	1	6
Heavy Vehicles %	0.0	5.4	0.0	0.0	3.5	0.0	0.5	0.0	0.0	0.5	0.0	12.5	0.0	0.0	1.7	0.0	7.7	0.0	0.0	0.6	1.1
Cars Enter Leg	18	35	1	1	55	1	207	1	0	209	0	14	101	0	115	146	12	5	0	163	542
Heavy Enter Leg	0	2	0	0	2	0	1	0	0	1	0	2	0	0	2	0	1	0	0	1	6
Total Entering Leg	18	37	1	1	57	1	208	1	0	210	0	16	101	0	117	146	13	5	0	164	548
Cars Exiting Leg	21					13					182					326					542
Heavy Exiting Leg	2					1					2					1					6
Total Exiting Leg	23					14					184					327					548

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	5	11	0	0	16	1	25	0	0	26	0	8	19	0	27	27	1	0	0	28	97
3:15 PM	0	13	0	0	13	1	32	0	0	33	0	15	18	0	33	29	0	0	0	29	108
3:30 PM	3	18	0	0	21	1	25	0	0	26	0	9	21	0	30	36	7	0	0	43	120
3:45 PM	4	15	0	0	19	1	48	0	0	49	0	4	22	0	26	31	4	2	0	37	131
Total	12	57	0	0	69	4	130	0	0	134	0	36	80	0	116	123	12	2	0	137	456
4:00 PM	9	5	1	0	15	0	55	1	0	56	0	6	23	0	29	47	2	1	0	50	150
4:15 PM	2	12	0	0	14	0	58	0	0	58	0	3	28	0	31	29	3	1	0	33	136
4:30 PM	3	3	0	1	7	0	46	0	0	46	0	1	28	0	29	39	3	1	0	43	125
4:45 PM	3	5	0	0	8	2	48	0	0	50	0	1	29	0	30	38	2	0	0	40	128
Total	17	25	1	1	44	2	207	1	0	210	0	11	108	0	119	153	10	3	0	166	539
5:00 PM	8	10	0	0	18	1	48	0	0	49	0	8	21	0	29	39	5	0	0	44	140
5:15 PM	6	6	1	0	13	3	38	1	0	42	0	4	13	0	17	34	1	0	0	35	107
5:30 PM	3	3	0	0	6	4	27	0	0	31	0	2	31	0	33	40	2	0	0	42	112
5:45 PM	3	9	2	0	14	1	34	1	0	36	0	6	18	0	24	21	0	0	0	21	95
Total	20	28	3	0	51	9	147	2	0	158	0	20	83	0	103	134	8	0	0	142	454
Grand Total	49	110	4	1	164	15	484	3	0	502	0	67	271	0	338	410	30	5	0	445	1449
Approach %	29.9	67.1	2.4	0.6		3.0	96.4	0.6	0.0		0.0	19.8	80.2	0.0		92.1	6.7	1.1	0.0		
Total %	3.4	7.6	0.3	0.1	11.3	1.0	33.4	0.2	0.0	34.6	0.0	4.6	18.7	0.0	23.3	28.3	2.1	0.3	0.0	30.7	
Exiting Leg Total	88					34					523					804					1449

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:45 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:45 PM	4	15	0	0	19	1	48	0	0	49	0	4	22	0	26	31	4	2	0	37	131
4:00 PM	9	5	1	0	15	0	55	1	0	56	0	6	23	0	29	47	2	1	0	50	150
4:15 PM	2	12	0	0	14	0	58	0	0	58	0	3	28	0	31	29	3	1	0	33	136
4:30 PM	3	3	0	1	7	0	46	0	0	46	0	1	28	0	29	39	3	1	0	43	125
Total Volume	18	35	1	1	55	1	207	1	0	209	0	14	101	0	115	146	12	5	0	163	542
% Approach Total	32.7	63.6	1.8	1.8		0.5	99.0	0.5	0.0		0.0	12.2	87.8	0.0		89.6	7.4	3.1	0.0		
PHF	0.500	0.583	0.250	0.250	0.724	0.250	0.892	0.250	0.000	0.901	0.000	0.583	0.902	0.000	0.927	0.777	0.750	0.625	0.000	0.815	0.903
Entering Leg	18	35	1	1	55	1	207	1	0	209	0	14	101	0	115	146	12	5	0	163	542
Exiting Leg					21					13					182					326	542
Total					76					222					297					489	1084

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
3:15 PM	0	0	0	0	0	0	0	1	0	1	0	2	1	0	3	0	0	0	0	0	4
3:30 PM	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	4
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	1	0	3	0	0	1	0	1	0	3	2	0	5	3	0	0	0	3	12
4:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	3
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	1	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	3
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	0	2	0	0	2	0	1	0	0	1	0	2	0	0	2	1	1	0	0	2	7
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	3
5:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
Total	0	2	0	0	2	0	1	0	0	1	0	2	0	0	2	0	1	0	0	1	6
Grand Total	0	6	1	0	7	0	2	1	0	3	0	7	2	0	9	4	2	0	0	6	25
Approach %	0.0	85.7	14.3	0.0		0.0	66.7	33.3	0.0		0.0	77.8	22.2	0.0		66.7	33.3	0.0	0.0		
Total %	0.0	24.0	4.0	0.0	28.0	0.0	8.0	4.0	0.0	12.0	0.0	28.0	8.0	0.0	36.0	16.0	8.0	0.0	0.0	24.0	
Exiting Leg Total	7					3					11					4					25
Buses	0	5	0	0	5	0	0	0	0	0	0	5	2	0	7	2	0	0	0	2	14
% Buses	0.0	83.3	0.0	0.0	71.4	0.0	0.0	0.0	0.0	0.0	0.0	71.4	100.0	0.0	77.8	50.0	0.0	0.0	0.0	33.3	56.0
Exiting Leg Total	5					0					7					2					14
Single-Unit Trucks	0	1	1	0	2	0	2	0	0	2	0	2	0	0	2	2	2	0	0	4	10
% Single-Unit	0.0	16.7	100.0	0.0	28.6	0.0	100.0	0.0	0.0	66.7	0.0	28.6	0.0	0.0	22.2	50.0	100.0	0.0	0.0	66.7	40.0
Exiting Leg Total	2					3					3					2					10
Articulated Trucks	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
% Articulated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
Exiting Leg Total	0					0					1					0					1

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
3:15 PM	0	0	0	0	0	0	0	1	0	1	0	2	1	0	3	0	0	0	0	0	4
3:30 PM	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	4
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	2	1	0	3	0	0	1	0	1	0	3	2	0	5	3	0	0	0	3	12
% Approach Total	0.0	66.7	33.3	0.0		0.0	0.0	100.0	0.0		0.0	60.0	40.0	0.0		100.0	0.0	0.0	0.0		
PHF	0.000	0.500	0.250	0.000	0.375	0.000	0.000	0.250	0.000	0.250	0.000	0.375	0.500	0.000	0.417	0.375	0.000	0.000	0.000	0.375	0.750
Buses	0	1	0	0	1	0	0	0	0	0	0	1	2	0	3	2	0	0	0	2	6
Buses %	0.0	50.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	33.3	100.0	0.0	60.0	66.7	0.0	0.0	0.0	66.7	50.0
Single-Unit Trucks	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	5
Single-Unit %	0.0	50.0	100.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	40.0	33.3	0.0	0.0	0.0	33.3	41.7
Articulated Trucks	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
Buses	0	1	0	0	1	0	0	0	0	0	0	1	2	0	3	2	0	0	0	2	6
Single-Unit Trucks	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	5
Articulated Trucks	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
Total Entering Leg	0	2	1	0	3	0	0	1	0	1	0	3	2	0	5	3	0	0	0	3	12
Buses	1					0					3					2					6
Single-Unit Trucks	2					1					2					0					5
Articulated Trucks	0					0					1					0					1
Total Exiting Leg	3					1					6					2					12

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	4	6	0	0	10	1	23	0	0	24	0	7	17	0	24	24	1	0	0	25	83
3:15 PM	0	11	0	0	11	1	26	0	0	27	0	14	16	0	30	29	0	0	0	29	97
3:30 PM	3	17	0	0	20	1	20	0	0	21	0	8	20	0	28	36	5	0	0	41	110
3:45 PM	3	15	0	0	18	1	39	0	0	40	0	4	21	0	25	31	3	2	0	36	119
Total	10	49	0	0	59	4	108	0	0	112	0	33	74	0	107	120	9	2	0	131	409
4:00 PM	9	5	1	0	15	0	52	1	0	53	0	5	22	0	27	46	2	1	0	49	144
4:15 PM	2	9	0	0	11	0	56	0	0	56	0	3	25	0	28	29	3	1	0	33	128
4:30 PM	2	3	0	1	6	0	42	0	0	42	0	1	26	0	27	38	2	1	0	41	116
4:45 PM	3	5	0	0	8	2	42	0	0	44	0	1	29	0	30	38	1	0	0	39	121
Total	16	22	1	1	40	2	192	1	0	195	0	10	102	0	112	151	8	3	0	162	509
5:00 PM	8	9	0	0	17	1	43	0	0	44	0	6	21	0	27	39	4	0	0	43	131
5:15 PM	6	6	1	0	13	3	36	1	0	40	0	3	13	0	16	34	1	0	0	35	104
5:30 PM	3	3	0	0	6	3	23	0	0	26	0	2	30	0	32	40	2	0	0	42	106
5:45 PM	2	8	2	0	12	1	30	1	0	32	0	4	17	0	21	20	0	0	0	20	85
Total	19	26	3	0	48	8	132	2	0	142	0	15	81	0	96	133	7	0	0	140	426
Grand Total	45	97	4	1	147	14	432	3	0	449	0	58	257	0	315	404	24	5	0	433	1344
Approach %	30.6	66.0	2.7	0.7		3.1	96.2	0.7	0.0		0.0	18.4	81.6	0.0		93.3	5.5	1.2	0.0		
Total %	3.3	7.2	0.3	0.1	10.9	1.0	32.1	0.2	0.0	33.4	0.0	4.3	19.1	0.0	23.4	30.1	1.8	0.4	0.0	32.2	
Exiting Leg Total	78					28					504					734					1344

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:00 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:00 PM	9	5	1	0	15	0	52	1	0	53	0	5	22	0	27	46	2	1	0	49	144
4:15 PM	2	9	0	0	11	0	56	0	0	56	0	3	25	0	28	29	3	1	0	33	128
4:30 PM	2	3	0	1	6	0	42	0	0	42	0	1	26	0	27	38	2	1	0	41	116
4:45 PM	3	5	0	0	8	2	42	0	0	44	0	1	29	0	30	38	1	0	0	39	121
Total Volume	16	22	1	1	40	2	192	1	0	195	0	10	102	0	112	151	8	3	0	162	509
% Approach Total	40.0	55.0	2.5	2.5		1.0	98.5	0.5	0.0		0.0	8.9	91.1	0.0		93.2	4.9	1.9	0.0		
PHF	0.444	0.611	0.250	0.250	0.667	0.250	0.857	0.250	0.000	0.871	0.000	0.500	0.879	0.000	0.933	0.821	0.667	0.750	0.000	0.827	0.884
Entering Leg	16	22	1	1	40	2	192	1	0	195	0	10	102	0	112	151	8	3	0	162	509
Exiting Leg	16					9					174					310					509
Total	56					204					286					472					1018

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Light Goods Vehicle**



	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	1	5	0	0	6	0	2	0	0	2	0	1	2	0	3	3	0	0	0	3	14
3:15 PM	0	2	0	0	2	0	6	0	0	6	0	1	2	0	3	0	0	0	0	0	11
3:30 PM	0	1	0	0	1	0	5	0	0	5	0	1	1	0	2	0	2	0	0	2	10
3:45 PM	1	0	0	0	1	0	9	0	0	9	0	0	1	0	1	0	1	0	0	1	12
Total	2	8	0	0	10	0	22	0	0	22	0	3	6	0	9	3	3	0	0	6	47
4:00 PM	0	0	0	0	0	0	3	0	0	3	0	1	1	0	2	1	0	0	0	1	6
4:15 PM	0	3	0	0	3	0	2	0	0	2	0	0	3	0	3	0	0	0	0	0	8
4:30 PM	1	0	0	0	1	0	4	0	0	4	0	0	2	0	2	1	1	0	0	2	9
4:45 PM	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	1	0	0	1	7
Total	1	3	0	0	4	0	15	0	0	15	0	1	6	0	7	2	2	0	0	4	30
5:00 PM	0	1	0	0	1	0	5	0	0	5	0	2	0	0	2	0	1	0	0	1	9
5:15 PM	0	0	0	0	0	0	2	0	0	2	0	1	0	0	1	0	0	0	0	0	3
5:30 PM	0	0	0	0	0	1	4	0	0	5	0	0	1	0	1	0	0	0	0	0	6
5:45 PM	1	1	0	0	2	0	4	0	0	4	0	2	1	0	3	1	0	0	0	1	10
Total	1	2	0	0	3	1	15	0	0	16	0	5	2	0	7	1	1	0	0	2	28
Grand Total	4	13	0	0	17	1	52	0	0	53	0	9	14	0	23	6	6	0	0	12	105
Approach %	23.5	76.5	0.0	0.0		1.9	98.1	0.0	0.0		0.0	39.1	60.9	0.0		50.0	50.0	0.0	0.0		
Total %	3.8	12.4	0.0	0.0	16.2	1.0	49.5	0.0	0.0	50.5	0.0	8.6	13.3	0.0	21.9	5.7	5.7	0.0	0.0	11.4	
Exiting Leg Total	10					6					19					70					105

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total	
	from North					from East					from South					from West						
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total		
3:00 PM	1	5	0	0	6	0	2	0	0	2	0	1	2	0	3	3	0	0	0	0	3	14
3:15 PM	0	2	0	0	2	0	6	0	0	6	0	1	2	0	3	0	0	0	0	0	0	11
3:30 PM	0	1	0	0	1	0	5	0	0	5	0	1	1	0	2	0	2	0	0	0	2	10
3:45 PM	1	0	0	0	1	0	9	0	0	9	0	0	1	0	1	0	1	0	0	0	1	12
Total Volume	2	8	0	0	10	0	22	0	0	22	0	3	6	0	9	3	3	0	0	6	47	
% Approach Total	20.0	80.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	33.3	66.7	0.0		50.0	50.0	0.0	0.0			
PHF	0.500	0.400	0.000	0.000	0.417	0.000	0.611	0.000	0.000	0.611	0.000	0.750	0.750	0.000	0.750	0.250	0.375	0.000	0.000	0.500	0.839	
Entering Leg	2	8	0	0	10	0	22	0	0	22	0	3	6	0	9	3	3	0	0	6	47	
Exiting Leg	3					3					11					30					47	
Total	13					25					20					36					94	

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	1	0	0	0	0	0	0	1	2	0	3	2	0	0	0	2	6
4:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
Total	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
Grand Total	0	5	0	0	5	0	0	0	0	0	0	5	2	0	7	2	0	0	0	2	14
Approach %	0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	71.4	28.6	0.0		100.0	0.0	0.0	0.0		
Total %	0.0	35.7	0.0	0.0	35.7	0.0	0.0	0.0	0.0	0.0	0.0	35.7	14.3	0.0	50.0	14.3	0.0	0.0	0.0	14.3	
Exiting Leg Total	5					0					7					2					14

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	4
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	1	0	0	1	0	0	0	0	0	0	1	2	0	3	2	0	0	0	2	6
% Approach Total	0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	33.3	66.7	0.0		100.0	0.0	0.0	0.0		
PHF	0.000	0.250	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.500	0.000	0.375	0.500	0.000	0.000	0.000	0.500	0.375
Entering Leg	0	1	0	0	1	0	0	0	0	0	0	1	2	0	3	2	0	0	0	2	6
Exiting Leg	1					0					3					2					6
Total	2					0					6					4					12

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
3:30 PM	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	5
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	0	2	3
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
5:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
Grand Total	0	1	1	0	2	0	2	0	0	2	0	2	0	0	2	2	2	0	0	4	10
Approach %	0.0	50.0	50.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		50.0	50.0	0.0	0.0		
Total %	0.0	10.0	10.0	0.0	20.0	0.0	20.0	0.0	0.0	20.0	0.0	20.0	0.0	0.0	20.0	20.0	20.0	0.0	0.0	40.0	
Exiting Leg Total	2					3					3					2					10

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:15 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
3:30 PM	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Volume	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	1	1	0	0	2	6
% Approach Total	0.0	50.0	50.0	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		50.0	50.0	0.0	0.0		
PHF	0.000	0.250	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.250	0.250	0.250	0.000	0.000	0.500	0.500
Entering Leg	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	1	1	0	0	2	6
Exiting Leg					2						2				2					0	6
Total					4					2				4						2	12

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
Approach %	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	0					0					1					0					1

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive					Old Bedford Road					Hanscom Drive					Old Bedford Road					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
% Approach Total	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250
Entering Leg	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
Exiting Leg	0					0					1					0					1
Total	0					1					1					0					2

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total	
	from North							from East							from South							from West								
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	1	
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	5	0	0	0	5	
5:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	0	2	0	1	5	0	0	0	6	
Grand Total	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	2	0	0	0	3	0	1	5	0	0	0	6	10	
Approach %	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	33.3	66.7	0.0	0.0	0.0		0.0	16.7	83.3	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	10.0	0.0	0.0	0.0	0.0	10.0		0.0	10.0	20.0	0.0	0.0	0.0	30.0	0.0	10.0	50.0	0.0	0.0	60.0	
Exiting Leg Total	6							1							0							3							10	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	5	0	0	0	5
5:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	0	2	0	1	5	0	0	0	6
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	50.0	50.0	0.0	0.0	0.0		0.0	16.7	83.3	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.250	0.000	0.000	0.000	0.500	0.000	0.250	0.250	0.000	0.000	0.000	0.300	0.375
Entering Leg	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	2	0	1	5	0	0	0	6	9
Exiting Leg	6							1							0							2							9
Total	6							2							2							8							18

PDI File #: **176038 E**
 Location: **N: Hanscom Drive S: Hanscom Drive**
 Location: **E: Old Bedford Road W: Old Bedford Road**
 City, State: **Lexington, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0							0							0							0							0

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive							Old Bedford Road							Hanscom Drive							Old Bedford Road							Total
	from North							from East							from South							from West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Exiting Leg	0							0							0							0							0
Total	0							0							0							0							0

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	13	11	0	24	59	17	0	76	53	40	0	93	193
6:15 AM	10	12	0	22	94	36	0	130	88	45	0	133	285
6:30 AM	16	21	0	37	88	48	0	136	122	43	0	165	338
6:45 AM	23	27	0	50	91	49	0	140	188	46	0	234	424
Total	62	71	0	133	332	150	0	482	451	174	0	625	1240
7:00 AM	25	27	1	53	83	54	0	137	178	39	0	217	407
7:15 AM	33	23	0	56	78	76	0	154	225	59	0	284	494
7:30 AM	35	26	0	61	80	104	0	184	235	83	0	318	563
7:45 AM	37	26	0	63	92	111	0	203	211	86	0	297	563
Total	130	102	1	233	333	345	0	678	849	267	0	1116	2027
8:00 AM	42	22	0	64	75	109	0	184	193	66	0	259	507
8:15 AM	22	32	0	54	62	99	0	161	225	62	0	287	502
8:30 AM	20	25	0	45	60	94	0	154	215	65	0	280	479
8:45 AM	12	25	0	37	75	115	0	190	214	73	0	287	514
Total	96	104	0	200	272	417	0	689	847	266	0	1113	2002
Grand Total	288	277	1	566	937	912	0	1849	2147	707	0	2854	5269
Approach %	50.9	48.9	0.2		50.7	49.3	0.0		75.2	24.8	0.0		
Total %	5.5	5.3	0.0	10.7	17.8	17.3	0.0	35.1	40.7	13.4	0.0	54.2	
Exiting Leg Total				1645				2424				1200	5269
Cars	282	258	1	541	907	861	0	1768	2104	699	0	2803	5112
% Cars	97.9	93.1	100.0	95.6	96.8	94.4	0.0	95.6	98.0	98.9	0.0	98.2	97.0
Exiting Leg Total				1607				2362				1143	5112
Heavy Vehicles	6	19	0	25	30	51	0	81	43	8	0	51	157
% Heavy Vehicles	2.1	6.9	0.0	4.4	3.2	5.6	0.0	4.4	2.0	1.1	0.0	1.8	3.0
Exiting Leg Total				38				62				57	157

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:30 AM	35	26	0	61	80	104	0	184	235	83	0	318	563
7:45 AM	37	26	0	63	92	111	0	203	211	86	0	297	563
8:00 AM	42	22	0	64	75	109	0	184	193	66	0	259	507
8:15 AM	22	32	0	54	62	99	0	161	225	62	0	287	502
Total Volume	136	106	0	242	309	423	0	732	864	297	0	1161	2135
% Approach Total	56.2	43.8	0.0		42.2	57.8	0.0		74.4	25.6	0.0		
PHF	0.810	0.828	0.000	0.945	0.840	0.953	0.000	0.901	0.919	0.863	0.000	0.913	0.948
Cars	134	103	0	237	301	401	0	702	853	294	0	1147	2086
Cars %	98.5	97.2	0.0	97.9	97.4	94.8	0.0	95.9	98.7	99.0	0.0	98.8	97.7
Heavy Vehicles	2	3	0	5	8	22	0	30	11	3	0	14	49
Heavy Vehicles %	1.5	2.8	0.0	2.1	2.6	5.2	0.0	4.1	1.3	1.0	0.0	1.2	2.3
Cars Enter Leg	134	103	0	237	301	401	0	702	853	294	0	1147	2086
Heavy Enter Leg	2	3	0	5	8	22	0	30	11	3	0	14	49
Total Entering Leg	136	106	0	242	309	423	0	732	864	297	0	1161	2135
Cars Exiting Leg				595				956				535	2086
Heavy Exiting Leg				11				14				24	49
Total Exiting Leg				606				970				559	2135

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	13	10	0	23	57	14	0	71	50	40	0	90	184
6:15 AM	10	12	0	22	90	34	0	124	88	44	0	132	278
6:30 AM	16	18	0	34	83	47	0	130	120	43	0	163	327
6:45 AM	23	23	0	46	90	46	0	136	184	45	0	229	411
Total	62	63	0	125	320	141	0	461	442	172	0	614	1200
7:00 AM	25	26	1	52	80	52	0	132	172	38	0	210	394
7:15 AM	31	21	0	52	77	65	0	142	215	57	0	272	466
7:30 AM	35	25	0	60	78	96	0	174	230	83	0	313	547
7:45 AM	37	25	0	62	89	106	0	195	210	86	0	296	553
Total	128	97	1	226	324	319	0	643	827	264	0	1091	1960
8:00 AM	40	22	0	62	73	104	0	177	189	64	0	253	492
8:15 AM	22	31	0	53	61	95	0	156	224	61	0	285	494
8:30 AM	18	23	0	41	59	92	0	151	209	65	0	274	466
8:45 AM	12	22	0	34	70	110	0	180	213	73	0	286	500
Total	92	98	0	190	263	401	0	664	835	263	0	1098	1952
Grand Total	282	258	1	541	907	861	0	1768	2104	699	0	2803	5112
Approach %	52.1	47.7	0.2		51.3	48.7	0.0		75.1	24.9	0.0		
Total %	5.5	5.0	0.0	10.6	17.7	16.8	0.0	34.6	41.2	13.7	0.0	54.8	
Exiting Leg Total				1607				2362				1143	5112

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Hanscom Drive					North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:30 AM	35	25	0	60		78	96	0	174	230	83	0	313	547
7:45 AM	37	25	0	62		89	106	0	195	210	86	0	296	553
8:00 AM	40	22	0	62		73	104	0	177	189	64	0	253	492
8:15 AM	22	31	0	53		61	95	0	156	224	61	0	285	494
Total Volume	134	103	0	237		301	401	0	702	853	294	0	1147	2086
% Approach Total	56.5	43.5	0.0			42.9	57.1	0.0		74.4	25.6	0.0		
PHF	0.838	0.831	0.000	0.956		0.846	0.946	0.000	0.900	0.927	0.855	0.000	0.916	0.943
Entering Leg	134	103	0	237		301	401	0	702	853	294	0	1147	2086
Exiting Leg				595					956				535	2086
Total				832					1658				1682	4172

PDI File #: **176038 F**
Location: **N: Hanscom Drive**
Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
City, State: **Lincoln, MA**
Client: **Fitzgerald & Halliday/M. Morehouse**
Site Code: **TBA**
Count Date: **Thursday, April 05, 2018**
Start Time: **6:00 AM**
End Time: **9:00 AM**
Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	1	0	1	2	3	0	5	3	0	0	3	9
6:15 AM	0	0	0	0	4	2	0	6	0	1	0	1	7
6:30 AM	0	3	0	3	5	1	0	6	2	0	0	2	11
6:45 AM	0	4	0	4	1	3	0	4	4	1	0	5	13
Total	0	8	0	8	12	9	0	21	9	2	0	11	40
7:00 AM	0	1	0	1	3	2	0	5	6	1	0	7	13
7:15 AM	2	2	0	4	1	11	0	12	10	2	0	12	28
7:30 AM	0	1	0	1	2	8	0	10	5	0	0	5	16
7:45 AM	0	1	0	1	3	5	0	8	1	0	0	1	10
Total	2	5	0	7	9	26	0	35	22	3	0	25	67
8:00 AM	2	0	0	2	2	5	0	7	4	2	0	6	15
8:15 AM	0	1	0	1	1	4	0	5	1	1	0	2	8
8:30 AM	2	2	0	4	1	2	0	3	6	0	0	6	13
8:45 AM	0	3	0	3	5	5	0	10	1	0	0	1	14
Total	4	6	0	10	9	16	0	25	12	3	0	15	50
Grand Total	6	19	0	25	30	51	0	81	43	8	0	51	157
Approach %	24.0	76.0	0.0		37.0	63.0	0.0		84.3	15.7	0.0		
Total %	3.8	12.1	0.0	15.9	19.1	32.5	0.0	51.6	27.4	5.1	0.0	32.5	
Exiting Leg Total	38				62				57				157
Buses	2	9	0	11	8	5	0	13	10	2	0	12	36
% Buses	33.3	47.4	0.0	44.0	26.7	9.8	0.0	16.0	23.3	25.0	0.0	23.5	22.9
Exiting Leg Total	10				19				7				36
Single-Unit Trucks	4	9	0	13	21	39	0	60	28	5	0	33	106
% Single-Unit	66.7	47.4	0.0	52.0	70.0	76.5	0.0	74.1	65.1	62.5	0.0	64.7	67.5
Exiting Leg Total	26				37				43				106
Articulated Trucks	0	1	0	1	1	7	0	8	5	1	0	6	15
% Articulated	0.0	5.3	0.0	4.0	3.3	13.7	0.0	9.9	11.6	12.5	0.0	11.8	9.6
Exiting Leg Total	2				6				7				15

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:45 AM	0	4	0	4	1	3	0	4	4	1	0	5	13
7:00 AM	0	1	0	1	3	2	0	5	6	1	0	7	13
7:15 AM	2	2	0	4	1	11	0	12	10	2	0	12	28
7:30 AM	0	1	0	1	2	8	0	10	5	0	0	5	16
Total Volume	2	8	0	10	7	24	0	31	25	4	0	29	70
% Approach Total	20.0	80.0	0.0		22.6	77.4	0.0		86.2	13.8	0.0		
PHF	0.250	0.500	0.000	0.625	0.583	0.545	0.000	0.646	0.625	0.500	0.000	0.604	0.625
Buses	1	4	0	5	1	4	0	5	10	2	0	12	22
Buses %	50.0	50.0	0.0	50.0	14.3	16.7	0.0	16.1	40.0	50.0	0.0	41.4	31.4
Single-Unit Trucks	1	4	0	5	6	14	0	20	11	1	0	12	37
Single-Unit %	50.0	50.0	0.0	50.0	85.7	58.3	0.0	64.5	44.0	25.0	0.0	41.4	52.9
Articulated Trucks	0	0	0	0	0	6	0	6	4	1	0	5	11
Articulated %	0.0	0.0	0.0	0.0	0.0	25.0	0.0	19.4	16.0	25.0	0.0	17.2	15.7
Buses	1	4	0	5	1	4	0	5	10	2	0	12	22
Single-Unit Trucks	1	4	0	5	6	14	0	20	11	1	0	12	37
Articulated Trucks	0	0	0	0	0	6	0	6	4	1	0	5	11
Total Entering Leg	2	8	0	10	7	24	0	31	25	4	0	29	70
Buses				3				14				5	22
Single-Unit Trucks				7				15				15	37
Articulated Trucks				1				4				6	11
Total Exiting Leg				11				33				26	70

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	13	8	0	21	45	8	0	53	45	30	0	75	149
6:15 AM	8	11	0	19	69	28	0	97	68	38	0	106	222
6:30 AM	14	16	0	30	66	38	0	104	102	37	0	139	273
6:45 AM	21	18	0	39	76	35	0	111	156	39	0	195	345
Total	56	53	0	109	256	109	0	365	371	144	0	515	989
7:00 AM	23	22	1	46	67	47	0	114	152	35	0	187	347
7:15 AM	30	19	0	49	68	52	0	120	193	54	0	247	416
7:30 AM	32	23	0	55	73	80	0	153	198	80	0	278	486
7:45 AM	35	22	0	57	87	92	0	179	201	80	0	281	517
Total	120	86	1	207	295	271	0	566	744	249	0	993	1766
8:00 AM	37	21	0	58	69	90	0	159	176	59	0	235	452
8:15 AM	20	29	0	49	53	83	0	136	210	60	0	270	455
8:30 AM	18	17	0	35	54	82	0	136	193	61	0	254	425
8:45 AM	11	22	0	33	67	99	0	166	197	72	0	269	468
Total	86	89	0	175	243	354	0	597	776	252	0	1028	1800
Grand Total	262	228	1	491	794	734	0	1528	1891	645	0	2536	4555
Approach %	53.4	46.4	0.2		52.0	48.0	0.0		74.6	25.4	0.0		
Total %	5.8	5.0	0.0	10.8	17.4	16.1	0.0	33.5	41.5	14.2	0.0	55.7	
Exiting Leg Total				1440				2119				996	4555

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:30 AM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:30 AM	32	23	0	55	73	80	0	153	198	80	0	278	486
7:45 AM	35	22	0	57	87	92	0	179	201	80	0	281	517
8:00 AM	37	21	0	58	69	90	0	159	176	59	0	235	452
8:15 AM	20	29	0	49	53	83	0	136	210	60	0	270	455
Total Volume	124	95	0	219	282	345	0	627	785	279	0	1064	1910
% Approach Total	56.6	43.4	0.0		45.0	55.0	0.0		73.8	26.2	0.0		
PHF	0.838	0.819	0.000	0.944	0.810	0.938	0.000	0.876	0.935	0.872	0.000	0.947	0.924
Entering Leg	124	95	0	219	282	345	0	627	785	279	0	1064	1910
Exiting Leg				561				880				469	1910
Total				780				1507				1533	3820

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Light Goods Vehicle**



	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	2	0	2	12	6	0	18	5	10	0	15	35
6:15 AM	2	1	0	3	21	6	0	27	20	6	0	26	56
6:30 AM	2	2	0	4	17	9	0	26	18	6	0	24	54
6:45 AM	2	5	0	7	14	11	0	25	28	6	0	34	66
Total	6	10	0	16	64	32	0	96	71	28	0	99	211
7:00 AM	2	4	0	6	13	5	0	18	20	3	0	23	47
7:15 AM	1	2	0	3	9	13	0	22	22	3	0	25	50
7:30 AM	3	2	0	5	5	16	0	21	32	3	0	35	61
7:45 AM	2	3	0	5	2	14	0	16	9	6	0	15	36
Total	8	11	0	19	29	48	0	77	83	15	0	98	194
8:00 AM	3	1	0	4	4	14	0	18	13	5	0	18	40
8:15 AM	2	2	0	4	8	12	0	20	14	1	0	15	39
8:30 AM	0	6	0	6	5	10	0	15	16	4	0	20	41
8:45 AM	1	0	0	1	3	11	0	14	16	1	0	17	32
Total	6	9	0	15	20	47	0	67	59	11	0	70	152
Grand Total	20	30	0	50	113	127	0	240	213	54	0	267	557
Approach %	40.0	60.0	0.0		47.1	52.9	0.0		79.8	20.2	0.0		
Total %	3.6	5.4	0.0	9.0	20.3	22.8	0.0	43.1	38.2	9.7	0.0	47.9	
Exiting Leg Total				167				243				147	557

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:45 AM	2	5	0	7	14	11	0	25	28	6	0	34	66
7:00 AM	2	4	0	6	13	5	0	18	20	3	0	23	47
7:15 AM	1	2	0	3	9	13	0	22	22	3	0	25	50
7:30 AM	3	2	0	5	5	16	0	21	32	3	0	35	61
Total Volume	8	13	0	21	41	45	0	86	102	15	0	117	224
% Approach Total	38.1	61.9	0.0		47.7	52.3	0.0		87.2	12.8	0.0		
PHF	0.667	0.650	0.000	0.750	0.732	0.703	0.000	0.860	0.797	0.625	0.000	0.836	0.848
Entering Leg	8	13	0	21	41	45	0	86	102	15	0	117	224
Exiting Leg				56				115				53	224
Total				77				201				170	448

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	1	0	1	1	1	0	2	0	0	0	0	3
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
6:45 AM	0	2	0	2	0	0	0	0	1	1	0	2	4
Total	0	3	0	3	2	1	0	3	1	1	0	2	8
7:00 AM	0	1	0	1	1	1	0	2	2	0	0	2	5
7:15 AM	1	1	0	2	0	2	0	2	6	1	0	7	11
7:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:45 AM	0	1	0	1	1	0	0	1	0	0	0	0	2
Total	1	3	0	4	2	4	0	6	9	1	0	10	20
8:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
8:15 AM	0	1	0	1	1	0	0	1	0	0	0	0	2
8:30 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
8:45 AM	0	2	0	2	2	0	0	2	0	0	0	0	4
Total	1	3	0	4	4	0	0	4	0	0	0	0	8
Grand Total	2	9	0	11	8	5	0	13	10	2	0	12	36
Approach %	18.2	81.8	0.0		61.5	38.5	0.0		83.3	16.7	0.0		
Total %	5.6	25.0	0.0	30.6	22.2	13.9	0.0	36.1	27.8	5.6	0.0	33.3	
Exiting Leg Total	10				19				7				36

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:45 AM	0	2	0	2	0	0	0	0	1	1	0	2	4
7:00 AM	0	1	0	1	1	1	0	2	2	0	0	2	5
7:15 AM	1	1	0	2	0	2	0	2	6	1	0	7	11
7:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
Total Volume	1	4	0	5	1	4	0	5	10	2	0	12	22
% Approach Total	20.0	80.0	0.0		20.0	80.0	0.0		83.3	16.7	0.0		
PHF	0.250	0.500	0.000	0.625	0.250	0.500	0.000	0.625	0.417	0.500	0.000	0.429	0.500
Entering Leg	1	4	0	5	1	4	0	5	10	2	0	12	22
Exiting Leg				3				14				5	22
Total				8				19				17	44

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	1	2	0	3	3	0	0	3	6
6:15 AM	0	0	0	0	4	2	0	6	0	1	0	1	7
6:30 AM	0	2	0	2	3	0	0	3	2	0	0	2	7
6:45 AM	0	2	0	2	1	2	0	3	2	0	0	2	7
Total	0	4	0	4	9	6	0	15	7	1	0	8	27
7:00 AM	0	0	0	0	2	1	0	3	4	0	0	4	7
7:15 AM	1	1	0	2	1	5	0	6	2	1	0	3	11
7:30 AM	0	1	0	1	2	6	0	8	3	0	0	3	12
7:45 AM	0	0	0	0	2	5	0	7	1	0	0	1	8
Total	1	2	0	3	7	17	0	24	10	1	0	11	38
8:00 AM	1	0	0	1	2	5	0	7	4	2	0	6	14
8:15 AM	0	0	0	0	0	4	0	4	1	1	0	2	6
8:30 AM	2	2	0	4	0	2	0	2	5	0	0	5	11
8:45 AM	0	1	0	1	3	5	0	8	1	0	0	1	10
Total	3	3	0	6	5	16	0	21	11	3	0	14	41
Grand Total	4	9	0	13	21	39	0	60	28	5	0	33	106
Approach %	30.8	69.2	0.0		35.0	65.0	0.0		84.8	15.2	0.0		
Total %	3.8	8.5	0.0	12.3	19.8	36.8	0.0	56.6	26.4	4.7	0.0	31.1	
Exiting Leg Total	26				37				43				106

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:15 AM	1	1	0	2	1	5	0	6	2	1	0	3	11
7:30 AM	0	1	0	1	2	6	0	8	3	0	0	3	12
7:45 AM	0	0	0	0	2	5	0	7	1	0	0	1	8
8:00 AM	1	0	0	1	2	5	0	7	4	2	0	6	14
Total Volume	2	2	0	4	7	21	0	28	10	3	0	13	45
% Approach Total	50.0	50.0	0.0		25.0	75.0	0.0		76.9	23.1	0.0		
PHF	0.500	0.500	0.000	0.500	0.875	0.875	0.000	0.875	0.625	0.375	0.000	0.542	0.804
Entering Leg	2	2	0	4	7	21	0	28	10	3	0	13	45
Exiting Leg	10				12				23				45
Total	14				40				36				90

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	1	0	1	1	1	0	2	0	0	0	0	3
6:45 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
Total	0	1	0	1	1	2	0	3	1	0	0	1	5
7:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
7:15 AM	0	0	0	0	0	4	0	4	2	0	0	2	6
7:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	5	0	5	3	1	0	4	9
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	1	1
Grand Total	0	1	0	1	1	7	0	8	5	1	0	6	15
Approach %	0.0	100.0	0.0		12.5	87.5	0.0		83.3	16.7	0.0		
Total %	0.0	6.7	0.0	6.7	6.7	46.7	0.0	53.3	33.3	6.7	0.0	40.0	
Exiting Leg Total	2				6				7				15

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:30 AM	0	1	0	1	1	1	0	2	0	0	0	0	3
6:45 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
7:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
7:15 AM	0	0	0	0	0	4	0	4	2	0	0	2	6
Total Volume	0	1	0	1	1	6	0	7	3	1	0	4	12
% Approach Total	0.0	100.0	0.0		14.3	85.7	0.0		75.0	25.0	0.0		
PHF	0.000	0.250	0.000	0.250	0.250	0.375	0.000	0.438	0.375	0.250	0.000	0.500	0.500
Entering Leg	0	1	0	1	1	6	0	7	3	1	0	4	12
Exiting Leg				2				4				6	12
Total				3				11				10	24

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Hanscom Drive						North Great Road (Route 2A)						North Great Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Grand Total	0	1	0	0	0	1	1	1	0	0	0	2	1	0	0	0	0	1	4
Approach %	0.0	100.0	0.0	0.0	0.0		50.0	50.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		
Total %	0.0	25.0	0.0	0.0	0.0	25.0	25.0	25.0	0.0	0.0	0.0	50.0	25.0	0.0	0.0	0.0	0.0	25.0	
Exiting Leg Total	1						2						1						4

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Hanscom Drive						North Great Road (Route 2A)						North Great Road (Route 2A)						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Total Volume	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	2
% Approach Total	0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.500
Entering Leg	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	2
Exiting Leg	0						2						0						2
Total	1						2						1						4

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Hanscom Drive						North Great Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Hanscom Drive						North Great Road (Route 2A)							North Great Road (Route 2A)							Total
	from North						from East						from West								
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total			
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Exiting Leg	0						0						0						0		
Total	0						0						0						0		

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	94	75	0	169	37	181	0	218	73	17	0	90	477
3:15 PM	58	49	0	107	37	194	0	231	89	22	0	111	449
3:30 PM	88	56	0	144	35	232	0	267	92	9	0	101	512
3:45 PM	86	62	0	148	35	215	0	250	90	13	0	103	501
Total	326	242	0	568	144	822	0	966	344	61	0	405	1939
4:00 PM	86	51	0	137	33	216	0	249	71	13	0	84	470
4:15 PM	87	69	0	156	41	245	0	286	78	12	0	90	532
4:30 PM	79	54	0	133	42	256	0	298	65	15	0	80	511
4:45 PM	72	41	0	113	53	265	0	318	59	15	0	74	505
Total	324	215	0	539	169	982	0	1151	273	55	0	328	2018
5:00 PM	74	53	0	127	31	242	0	273	87	22	0	109	509
5:15 PM	80	39	0	119	35	247	0	282	76	19	0	95	496
5:30 PM	68	43	0	111	44	265	0	309	77	18	0	95	515
5:45 PM	52	39	0	91	26	249	0	275	66	16	0	82	448
Total	274	174	0	448	136	1003	0	1139	306	75	0	381	1968
Grand Total	924	631	0	1555	449	2807	0	3256	923	191	0	1114	5925
Approach %	59.4	40.6	0.0		13.8	86.2	0.0		82.9	17.1	0.0		
Total %	15.6	10.6	0.0	26.2	7.6	47.4	0.0	55.0	15.6	3.2	0.0	18.8	
Exiting Leg Total				640				1554				3731	5925
Cars	916	618	0	1534	440	2769	0	3209	893	189	0	1082	5825
% Cars	99.1	97.9	0.0	98.6	98.0	98.6	0.0	98.6	96.7	99.0	0.0	97.1	98.3
Exiting Leg Total				629				1511				3685	5825
Heavy Vehicles	8	13	0	21	9	38	0	47	30	2	0	32	100
% Heavy Vehicles	0.9	2.1	0.0	1.4	2.0	1.4	0.0	1.4	3.3	1.0	0.0	2.9	1.7
Exiting Leg Total				11				43				46	100

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:15 PM	87	69	0	156	41	245	0	286	78	12	0	90	532
4:30 PM	79	54	0	133	42	256	0	298	65	15	0	80	511
4:45 PM	72	41	0	113	53	265	0	318	59	15	0	74	505
5:00 PM	74	53	0	127	31	242	0	273	87	22	0	109	509
Total Volume	312	217	0	529	167	1008	0	1175	289	64	0	353	2057
% Approach Total	59.0	41.0	0.0		14.2	85.8	0.0		81.9	18.1	0.0		
PHF	0.897	0.786	0.000	0.848	0.788	0.951	0.000	0.924	0.830	0.727	0.000	0.810	0.967
Cars	312	213	0	525	165	1002	0	1167	280	64	0	344	2036
Cars %	100.0	98.2	0.0	99.2	98.8	99.4	0.0	99.3	96.9	100.0	0.0	97.5	99.0
Heavy Vehicles	0	4	0	4	2	6	0	8	9	0	0	9	21
Heavy Vehicles %	0.0	1.8	0.0	0.8	1.2	0.6	0.0	0.7	3.1	0.0	0.0	2.5	1.0
Cars Enter Leg	312	213	0	525	165	1002	0	1167	280	64	0	344	2036
Heavy Enter Leg	0	4	0	4	2	6	0	8	9	0	0	9	21
Total Entering Leg	312	217	0	529	167	1008	0	1175	289	64	0	353	2057
Cars Exiting Leg				229				493				1314	2036
Heavy Exiting Leg				2				13				6	21
Total Exiting Leg				231				506				1320	2057

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	90	70	0	160	36	176	0	212	71	16	0	87	459
3:15 PM	58	48	0	106	35	191	0	226	85	21	0	106	438
3:30 PM	85	55	0	140	35	225	0	260	90	9	0	99	499
3:45 PM	86	62	0	148	34	206	0	240	89	13	0	102	490
Total	319	235	0	554	140	798	0	938	335	59	0	394	1886
4:00 PM	85	51	0	136	32	214	0	246	68	13	0	81	463
4:15 PM	87	67	0	154	41	243	0	284	76	12	0	88	526
4:30 PM	79	54	0	133	41	255	0	296	62	15	0	77	506
4:45 PM	72	39	0	111	52	263	0	315	58	15	0	73	499
Total	323	211	0	534	166	975	0	1141	264	55	0	319	1994
5:00 PM	74	53	0	127	31	241	0	272	84	22	0	106	505
5:15 PM	80	38	0	118	34	245	0	279	73	19	0	92	489
5:30 PM	68	43	0	111	44	264	0	308	74	18	0	92	511
5:45 PM	52	38	0	90	25	246	0	271	63	16	0	79	440
Total	274	172	0	446	134	996	0	1130	294	75	0	369	1945
Grand Total	916	618	0	1534	440	2769	0	3209	893	189	0	1082	5825
Approach %	59.7	40.3	0.0		13.7	86.3	0.0		82.5	17.5	0.0		
Total %	15.7	10.6	0.0	26.3	7.6	47.5	0.0	55.1	15.3	3.2	0.0	18.6	
Exiting Leg Total				629				1511				3685	5825

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:15 PM	87	67	0	154	41	243	0	284	76	12	0	88	526
4:30 PM	79	54	0	133	41	255	0	296	62	15	0	77	506
4:45 PM	72	39	0	111	52	263	0	315	58	15	0	73	499
5:00 PM	74	53	0	127	31	241	0	272	84	22	0	106	505
Total Volume	312	213	0	525	165	1002	0	1167	280	64	0	344	2036
% Approach Total	59.4	40.6	0.0		14.1	85.9	0.0		81.4	18.6	0.0		
PHF	0.897	0.795	0.000	0.852	0.793	0.952	0.000	0.926	0.833	0.727	0.000	0.811	0.968
Entering Leg	312	213	0	525	165	1002	0	1167	280	64	0	344	2036
Exiting Leg				229				493				1314	2036
Total				754				1660				1658	4072

PDI File #: **176038 F**
Location: **N: Hanscom Drive**
Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
City, State: **Lincoln, MA**
Client: **Fitzgerald & Halliday/M. Morehouse**
Site Code: **TBA**
Count Date: **Thursday, April 05, 2018**
Start Time: **3:00 PM**
End Time: **6:00 PM**



Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	4	5	0	9	1	5	0	6	2	1	0	3	18
3:15 PM	0	1	0	1	2	3	0	5	4	1	0	5	11
3:30 PM	3	1	0	4	0	7	0	7	2	0	0	2	13
3:45 PM	0	0	0	0	1	9	0	10	1	0	0	1	11
Total	7	7	0	14	4	24	0	28	9	2	0	11	53
4:00 PM	1	0	0	1	1	2	0	3	3	0	0	3	7
4:15 PM	0	2	0	2	0	2	0	2	2	0	0	2	6
4:30 PM	0	0	0	0	1	1	0	2	3	0	0	3	5
4:45 PM	0	2	0	2	1	2	0	3	1	0	0	1	6
Total	1	4	0	5	3	7	0	10	9	0	0	9	24
5:00 PM	0	0	0	0	0	1	0	1	3	0	0	3	4
5:15 PM	0	1	0	1	1	2	0	3	3	0	0	3	7
5:30 PM	0	0	0	0	0	1	0	1	3	0	0	3	4
5:45 PM	0	1	0	1	1	3	0	4	3	0	0	3	8
Total	0	2	0	2	2	7	0	9	12	0	0	12	23
Grand Total	8	13	0	21	9	38	0	47	30	2	0	32	100
Approach %	38.1	61.9	0.0		19.1	80.9	0.0		93.8	6.3	0.0		
Total %	8.0	13.0	0.0	21.0	9.0	38.0	0.0	47.0	30.0	2.0	0.0	32.0	
Exiting Leg Total	11				43				46				100
Buses	2	7	0	9	5	7	0	12	14	2	0	16	37
% Buses	25.0	53.8	0.0	42.9	55.6	18.4	0.0	25.5	46.7	100.0	0.0	50.0	37.0
Exiting Leg Total	7				21				9				37
Single-Unit Trucks	5	5	0	10	3	24	0	27	14	0	0	14	51
% Single-Unit	62.5	38.5	0.0	47.6	33.3	63.2	0.0	57.4	46.7	0.0	0.0	43.8	51.0
Exiting Leg Total	3				19				29				51
Articulated Trucks	1	1	0	2	1	7	0	8	2	0	0	2	12
% Articulated	12.5	7.7	0.0	9.5	11.1	18.4	0.0	17.0	6.7	0.0	0.0	6.3	12.0
Exiting Leg Total	1				3				8				12

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	4	5	0	9	1	5	0	6	2	1	0	3	18
3:15 PM	0	1	0	1	2	3	0	5	4	1	0	5	11
3:30 PM	3	1	0	4	0	7	0	7	2	0	0	2	13
3:45 PM	0	0	0	0	1	9	0	10	1	0	0	1	11
Total Volume	7	7	0	14	4	24	0	28	9	2	0	11	53
% Approach Total	50.0	50.0	0.0		14.3	85.7	0.0		81.8	18.2	0.0		
PHF	0.438	0.350	0.000	0.389	0.500	0.667	0.000	0.700	0.563	0.500	0.000	0.550	0.736
Buses	2	2	0	4	1	5	0	6	4	2	0	6	16
Buses %	28.6	28.6	0.0	28.6	25.0	20.8	0.0	21.4	44.4	100.0	0.0	54.5	30.2
Single-Unit Trucks	4	4	0	8	3	16	0	19	5	0	0	5	32
Single-Unit %	57.1	57.1	0.0	57.1	75.0	66.7	0.0	67.9	55.6	0.0	0.0	45.5	60.4
Articulated Trucks	1	1	0	2	0	3	0	3	0	0	0	0	5
Articulated %	14.3	14.3	0.0	14.3	0.0	12.5	0.0	10.7	0.0	0.0	0.0	0.0	9.4
Buses	2	2	0	4	1	5	0	6	4	2	0	6	16
Single-Unit Trucks	4	4	0	8	3	16	0	19	5	0	0	5	32
Articulated Trucks	1	1	0	2	0	3	0	3	0	0	0	0	5
Total Entering Leg	7	7	0	14	4	24	0	28	9	2	0	11	53
Buses				3				6				7	16
Single-Unit Trucks				3				9				20	32
Articulated Trucks				0				1				4	5
Total Exiting Leg				6				16				31	53

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	77	56	0	133	31	149	0	180	69	15	0	84	397
3:15 PM	55	41	0	96	34	166	0	200	77	18	0	95	391
3:30 PM	79	49	0	128	35	202	0	237	83	8	0	91	456
3:45 PM	80	55	0	135	32	178	0	210	79	12	0	91	436
Total	291	201	0	492	132	695	0	827	308	53	0	361	1680
4:00 PM	76	47	0	123	30	188	0	218	60	12	0	72	413
4:15 PM	85	60	0	145	37	219	0	256	69	12	0	81	482
4:30 PM	74	43	0	117	41	234	0	275	56	15	0	71	463
4:45 PM	70	39	0	109	52	244	0	296	57	15	0	72	477
Total	305	189	0	494	160	885	0	1045	242	54	0	296	1835
5:00 PM	70	50	0	120	28	226	0	254	75	17	0	92	466
5:15 PM	78	37	0	115	33	228	0	261	69	17	0	86	462
5:30 PM	64	39	0	103	41	245	0	286	67	17	0	84	473
5:45 PM	50	33	0	83	22	238	0	260	56	12	0	68	411
Total	262	159	0	421	124	937	0	1061	267	63	0	330	1812
Grand Total	858	549	0	1407	416	2517	0	2933	817	170	0	987	5327
Approach %	61.0	39.0	0.0		14.2	85.8	0.0		82.8	17.2	0.0		
Total %	16.1	10.3	0.0	26.4	7.8	47.2	0.0	55.1	15.3	3.2	0.0	18.5	
Exiting Leg Total				586				1366				3375	5327

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
4:15 PM	85	60	0	145	37	219	0	256	69	12	0	81	482
4:30 PM	74	43	0	117	41	234	0	275	56	15	0	71	463
4:45 PM	70	39	0	109	52	244	0	296	57	15	0	72	477
5:00 PM	70	50	0	120	28	226	0	254	75	17	0	92	466
Total Volume	299	192	0	491	158	923	0	1081	257	59	0	316	1888
% Approach Total	60.9	39.1	0.0		14.6	85.4	0.0		81.3	18.7	0.0		
PHF	0.879	0.800	0.000	0.847	0.760	0.946	0.000	0.913	0.857	0.868	0.000	0.859	0.979
Entering Leg	299	192	0	491	158	923	0	1081	257	59	0	316	1888
Exiting Leg				217				449				1222	1888
Total				708				1530				1538	3776

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Light Goods Vehicle

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	13	14	0	27	5	27	0	32	2	1	0	3	62
3:15 PM	3	7	0	10	1	25	0	26	8	3	0	11	47
3:30 PM	6	6	0	12	0	23	0	23	7	1	0	8	43
3:45 PM	6	7	0	13	2	28	0	30	10	1	0	11	54
Total	28	34	0	62	8	103	0	111	27	6	0	33	206
4:00 PM	9	4	0	13	2	26	0	28	8	1	0	9	50
4:15 PM	2	7	0	9	4	24	0	28	7	0	0	7	44
4:30 PM	5	11	0	16	0	21	0	21	6	0	0	6	43
4:45 PM	2	0	0	2	0	19	0	19	1	0	0	1	22
Total	18	22	0	40	6	90	0	96	22	1	0	23	159
5:00 PM	4	3	0	7	3	15	0	18	9	5	0	14	39
5:15 PM	2	1	0	3	1	17	0	18	4	2	0	6	27
5:30 PM	4	4	0	8	3	19	0	22	7	1	0	8	38
5:45 PM	2	5	0	7	3	8	0	11	7	4	0	11	29
Total	12	13	0	25	10	59	0	69	27	12	0	39	133
Grand Total	58	69	0	127	24	252	0	276	76	19	0	95	498
Approach %	45.7	54.3	0.0		8.7	91.3	0.0		80.0	20.0	0.0		
Total %	11.6	13.9	0.0	25.5	4.8	50.6	0.0	55.4	15.3	3.8	0.0	19.1	
Exiting Leg Total				43				145				310	498

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive					North Great Road (Route 2A)					North Great Road (Route 2A)					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total		Thru	Left	U-Turn	Total		
3:00 PM	13	14	0	27		5	27	0	32		2	1	0	3		62
3:15 PM	3	7	0	10		1	25	0	26		8	3	0	11		47
3:30 PM	6	6	0	12		0	23	0	23		7	1	0	8		43
3:45 PM	6	7	0	13		2	28	0	30		10	1	0	11		54
Total Volume	28	34	0	62		8	103	0	111		27	6	0	33		206
% Approach Total	45.2	54.8	0.0			7.2	92.8	0.0			81.8	18.2	0.0			
PHF	0.538	0.607	0.000	0.574		0.400	0.920	0.000	0.867		0.675	0.500	0.000	0.750		0.831
Entering Leg	28	34	0	62		8	103	0	111		27	6	0	33		206
Exiting Leg				14					61					131		206
Total				76					172					164		412

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Hanscom Drive					North Great Road (Route 2A)					North Great Road (Route 2A)					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total			
3:00 PM	1	2	0	3		1	2	0	3	1	1	0	2	8		
3:15 PM	0	0	0	0		0	0	0	0	1	1	0	2	2		
3:30 PM	1	0	0	1		0	1	0	1	2	0	0	2	4		
3:45 PM	0	0	0	0		0	2	0	2	0	0	0	0	2		
Total	2	2	0	4		1	5	0	6	4	2	0	6	16		
4:00 PM	0	0	0	0		1	0	0	1	2	0	0	2	3		
4:15 PM	0	2	0	2		0	0	0	0	2	0	0	2	4		
4:30 PM	0	0	0	0		1	0	0	1	2	0	0	2	3		
4:45 PM	0	1	0	1		0	1	0	1	0	0	0	0	2		
Total	0	3	0	3		2	1	0	3	6	0	0	6	12		
5:00 PM	0	0	0	0		0	0	0	0	1	0	0	1	1		
5:15 PM	0	1	0	1		1	0	0	1	1	0	0	1	3		
5:30 PM	0	0	0	0		0	0	0	0	2	0	0	2	2		
5:45 PM	0	1	0	1		1	1	0	2	0	0	0	0	3		
Total	0	2	0	2		2	1	0	3	4	0	0	4	9		
Grand Total	2	7	0	9		5	7	0	12	14	2	0	16	37		
Approach %	22.2	77.8	0.0			41.7	58.3	0.0		87.5	12.5	0.0				
Total %	5.4	18.9	0.0	24.3		13.5	18.9	0.0	32.4	37.8	5.4	0.0	43.2			
Exiting Leg Total	7					21					9					37

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive					North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	1	2	0	3		1	2	0	3	1	1	0	2	8
3:15 PM	0	0	0	0		0	0	0	0	1	1	0	2	2
3:30 PM	1	0	0	1		0	1	0	1	2	0	0	2	4
3:45 PM	0	0	0	0		0	2	0	2	0	0	0	0	2
Total Volume	2	2	0	4		1	5	0	6	4	2	0	6	16
% Approach Total	50.0	50.0	0.0			16.7	83.3	0.0		66.7	33.3	0.0		
PHF	0.500	0.250	0.000	0.333		0.250	0.625	0.000	0.500	0.500	0.500	0.000	0.750	0.500
Entering Leg	2	2	0	4		1	5	0	6	4	2	0	6	16
Exiting Leg				3					6				7	16
Total				7					12				13	32

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	3	2	0	5	0	3	0	3	1	0	0	1	9
3:15 PM	0	1	0	1	2	3	0	5	3	0	0	3	9
3:30 PM	1	1	0	2	0	5	0	5	0	0	0	0	7
3:45 PM	0	0	0	0	1	5	0	6	1	0	0	1	7
Total	4	4	0	8	3	16	0	19	5	0	0	5	32
4:00 PM	1	0	0	1	0	2	0	2	1	0	0	1	4
4:15 PM	0	0	0	0	0	2	0	2	0	0	0	0	2
4:30 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
4:45 PM	0	1	0	1	0	0	0	0	1	0	0	1	2
Total	1	1	0	2	0	5	0	5	3	0	0	3	10
5:00 PM	0	0	0	0	0	0	0	0	2	0	0	2	2
5:15 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:30 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:45 PM	0	0	0	0	0	1	0	1	2	0	0	2	3
Total	0	0	0	0	0	3	0	3	6	0	0	6	9
Grand Total	5	5	0	10	3	24	0	27	14	0	0	14	51
Approach %	50.0	50.0	0.0		11.1	88.9	0.0		100.0	0.0	0.0		
Total %	9.8	9.8	0.0	19.6	5.9	47.1	0.0	52.9	27.5	0.0	0.0	27.5	
Exiting Leg Total	3				19				29				51

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive				North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	3	2	0	5	0	3	0	3	1	0	0	1	9
3:15 PM	0	1	0	1	2	3	0	5	3	0	0	3	9
3:30 PM	1	1	0	2	0	5	0	5	0	0	0	0	7
3:45 PM	0	0	0	0	1	5	0	6	1	0	0	1	7
Total Volume	4	4	0	8	3	16	0	19	5	0	0	5	32
% Approach Total	50.0	50.0	0.0		15.8	84.2	0.0		100.0	0.0	0.0		
PHF	0.333	0.500	0.000	0.400	0.375	0.800	0.000	0.792	0.417	0.000	0.000	0.417	0.889
Entering Leg	4	4	0	8	3	16	0	19	5	0	0	5	32
Exiting Leg				3				9				20	32
Total				11				28				25	64

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Hanscom Drive					North Great Road (Route 2A)					North Great Road (Route 2A)					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total		Thru	Left	U-Turn	Total		
3:00 PM	0	1	0	1		0	0	0	0		0	0	0	0		1
3:15 PM	0	0	0	0		0	0	0	0		0	0	0	0		0
3:30 PM	1	0	0	1		0	1	0	1		0	0	0	0		2
3:45 PM	0	0	0	0		0	2	0	2		0	0	0	0		2
Total	1	1	0	2		0	3	0	3		0	0	0	0		5
4:00 PM	0	0	0	0		0	0	0	0		0	0	0	0		0
4:15 PM	0	0	0	0		0	0	0	0		0	0	0	0		0
4:30 PM	0	0	0	0		0	0	0	0		0	0	0	0		0
4:45 PM	0	0	0	0		1	1	0	2		0	0	0	0		2
Total	0	0	0	0		1	1	0	2		0	0	0	0		2
5:00 PM	0	0	0	0		0	1	0	1		0	0	0	0		1
5:15 PM	0	0	0	0		0	1	0	1		1	0	0	1		2
5:30 PM	0	0	0	0		0	0	0	0		0	0	0	0		0
5:45 PM	0	0	0	0		0	1	0	1		1	0	0	1		2
Total	0	0	0	0		0	3	0	3		2	0	0	2		5
Grand Total	1	1	0	2		1	7	0	8		2	0	0	2		12
Approach %	50.0	50.0	0.0			12.5	87.5	0.0			100.0	0.0	0.0			
Total %	8.3	8.3	0.0	16.7		8.3	58.3	0.0	66.7		16.7	0.0	0.0	16.7		
Exiting Leg Total	1					3					8					12

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive					North Great Road (Route 2A)				North Great Road (Route 2A)				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	1	0	1		0	0	0	0	0	0	0	0	1
3:15 PM	0	0	0	0		0	0	0	0	0	0	0	0	0
3:30 PM	1	0	0	1		0	1	0	1	0	0	0	0	2
3:45 PM	0	0	0	0		0	2	0	2	0	0	0	0	2
Total Volume	1	1	0	2		0	3	0	3	0	0	0	0	5
% Approach Total	50.0	50.0	0.0			0.0	100.0	0.0		0.0	0.0	0.0		
PHF	0.250	0.250	0.000	0.500		0.000	0.375	0.000	0.375	0.000	0.000	0.000	0.000	0.625
Entering Leg	1	1	0	2		0	3	0	3	0	0	0	0	5
Exiting Leg				0					1				4	5
Total				2					4				4	10

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Hanscom Drive							North Great Road (Route 2A)							North Great Road (Route 2A)							Total
	from North							from East							from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total				
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3:30 PM	0	2	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2		
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	0	2	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	2		
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1		
4:45 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1		
Total	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	2		
5:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1		
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1		
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	2		
Grand Total	0	2	0	0	0	2	2	2	1	0	0	0	3	1	0	0	0	0	1	6		
Approach %	0.0	100.0	0.0	0.0	0.0			66.7	33.3	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0				
Total %	0.0	33.3	0.0	0.0	0.0	33.3		33.3	16.7	0.0	0.0	0.0	50.0	16.7	0.0	0.0	0.0	0.0	16.7			
Exiting Leg Total	2							3							1							6

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Hanscom Drive						North Great Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
4:45 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	1
5:00 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1
5:15 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	1
Total Volume	0	0	0	0	0	0	2	1	0	0	0	3	1	0	0	0	0	1	4	4
% Approach Total	0.0	0.0	0.0	0.0	0.0		66.7	33.3	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0			
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.250	0.000	0.000	0.000	0.750	0.250	0.000	0.000	0.000	0.000	0.250	1.000	
Entering Leg	0	0	0	0	0	0	2	1	0	0	0	3	1	0	0	0	0	1	4	4
Exiting Leg	2						1						1						4	
Total	2						4						2						8	

PDI File #: **176038 F**
 Location: **N: Hanscom Drive**
 Location: **E: North Great Road (Route 2A) W: North Great Road (Route 2A)**
 City, State: **Lincoln, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Hanscom Drive						North Great Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Hanscom Drive						North Great Road (Route 2A)						North Great Road (Route 2A)						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0	
Total	0						0						0						0	

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	4	14	0	18	1	2	0	3	25	22	0	47	68
6:15 AM	11	35	0	46	2	5	0	7	52	43	0	95	148
6:30 AM	11	35	0	46	7	18	0	25	96	40	0	136	207
6:45 AM	8	42	0	50	8	14	0	22	94	60	0	154	226
Total	34	126	0	160	18	39	0	57	267	165	0	432	649
7:00 AM	18	31	0	49	11	8	0	19	104	60	0	164	232
7:15 AM	32	40	0	72	22	26	0	48	85	71	0	156	276
7:30 AM	34	51	0	85	14	24	0	38	68	69	0	137	260
7:45 AM	37	38	0	75	15	21	0	36	62	66	1	129	240
Total	121	160	0	281	62	79	0	141	319	266	1	586	1008
8:00 AM	29	71	0	100	23	24	0	47	66	75	0	141	288
8:15 AM	26	42	0	68	20	26	0	46	85	84	0	169	283
8:30 AM	48	39	0	87	18	22	0	40	50	84	0	134	261
8:45 AM	35	57	0	92	24	27	0	51	84	100	0	184	327
Total	138	209	0	347	85	99	0	184	285	343	0	628	1159
Grand Total	293	495	0	788	165	217	0	382	871	774	1	1646	2816
Approach %	37.2	62.8	0.0		43.2	56.8	0.0		52.9	47.0	0.1		
Total %	10.4	17.6	0.0	28.0	5.9	7.7	0.0	13.6	30.9	27.5	0.0	58.5	
Exiting Leg Total	939				1366				511				2816
Cars	278	490	0	768	163	207	0	370	864	763	1	1628	2766
% Cars	94.9	99.0	0.0	97.5	98.8	95.4	0.0	96.9	99.2	98.6	100.0	98.9	98.2
Exiting Leg Total	926				1354				486				2766
Heavy Vehicles	15	5	0	20	2	10	0	12	7	11	0	18	50
% Heavy Vehicles	5.1	1.0	0.0	2.5	1.2	4.6	0.0	3.1	0.8	1.4	0.0	1.1	1.8
Exiting Leg Total	13				12				25				50

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
8:00 AM	29	71	0	100	23	24	0	47	66	75	0	141	288
8:15 AM	26	42	0	68	20	26	0	46	85	84	0	169	283
8:30 AM	48	39	0	87	18	22	0	40	50	84	0	134	261
8:45 AM	35	57	0	92	24	27	0	51	84	100	0	184	327
Total Volume	138	209	0	347	85	99	0	184	285	343	0	628	1159
% Approach Total	39.8	60.2	0.0		46.2	53.8	0.0		45.4	54.6	0.0		
PHF	0.719	0.736	0.000	0.868	0.885	0.917	0.000	0.902	0.838	0.858	0.000	0.853	0.886
Cars	131	206	0	337	84	97	0	181	282	340	0	622	1140
Cars %	94.9	98.6	0.0	97.1	98.8	98.0	0.0	98.4	98.9	99.1	0.0	99.0	98.4
Heavy Vehicles	7	3	0	10	1	2	0	3	3	3	0	6	19
Heavy Vehicles %	5.1	1.4	0.0	2.9	1.2	2.0	0.0	1.6	1.1	0.9	0.0	1.0	1.6
Cars Enter Leg	131	206	0	337	84	97	0	181	282	340	0	622	1140
Heavy Enter Leg	7	3	0	10	1	2	0	3	3	3	0	6	19
Total Entering Leg	138	209	0	347	85	99	0	184	285	343	0	628	1159
Cars Exiting Leg				424				488				228	1140
Heavy Exiting Leg				4				6				9	19
Total Exiting Leg				428				494				237	1159

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	4	14	0	18	1	2	0	3	25	21	0	46	67
6:15 AM	11	35	0	46	2	5	0	7	52	42	0	94	147
6:30 AM	11	35	0	46	7	16	0	23	95	40	0	135	204
6:45 AM	8	42	0	50	8	14	0	22	93	60	0	153	225
Total	34	126	0	160	18	37	0	55	265	163	0	428	643
7:00 AM	17	30	0	47	11	7	0	18	104	59	0	163	228
7:15 AM	31	40	0	71	21	24	0	45	84	71	0	155	271
7:30 AM	30	51	0	81	14	23	0	37	67	66	0	133	251
7:45 AM	35	37	0	72	15	19	0	34	62	64	1	127	233
Total	113	158	0	271	61	73	0	134	317	260	1	578	983
8:00 AM	28	69	0	97	23	22	0	45	64	75	0	139	281
8:15 AM	25	42	0	67	19	26	0	45	85	83	0	168	280
8:30 AM	45	39	0	84	18	22	0	40	49	82	0	131	255
8:45 AM	33	56	0	89	24	27	0	51	84	100	0	184	324
Total	131	206	0	337	84	97	0	181	282	340	0	622	1140
Grand Total	278	490	0	768	163	207	0	370	864	763	1	1628	2766
Approach %	36.2	63.8	0.0		44.1	55.9	0.0		53.1	46.9	0.1		
Total %	10.1	17.7	0.0	27.8	5.9	7.5	0.0	13.4	31.2	27.6	0.0	58.9	
Exiting Leg Total				926				1354				486	2766

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
8:00 AM	28	69	0	97	23	22	0	45	64	75	0	139	281
8:15 AM	25	42	0	67	19	26	0	45	85	83	0	168	280
8:30 AM	45	39	0	84	18	22	0	40	49	82	0	131	255
8:45 AM	33	56	0	89	24	27	0	51	84	100	0	184	324
Total Volume	131	206	0	337	84	97	0	181	282	340	0	622	1140
% Approach Total	38.9	61.1	0.0		46.4	53.6	0.0		45.3	54.7	0.0		
PHF	0.728	0.746	0.000	0.869	0.875	0.898	0.000	0.887	0.829	0.850	0.000	0.845	0.880
Entering Leg	131	206	0	337	84	97	0	181	282	340	0	622	1140
Exiting Leg				424				488				228	1140
Total				761				669				850	2280

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:30 AM	0	0	0	0	0	2	0	2	1	0	0	1	3
6:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	2	0	2	2	2	0	4	6
7:00 AM	1	1	0	2	0	1	0	1	0	1	0	1	4
7:15 AM	1	0	0	1	1	2	0	3	1	0	0	1	5
7:30 AM	4	0	0	4	0	1	0	1	1	3	0	4	9
7:45 AM	2	1	0	3	0	2	0	2	0	2	0	2	7
Total	8	2	0	10	1	6	0	7	2	6	0	8	25
8:00 AM	1	2	0	3	0	2	0	2	2	0	0	2	7
8:15 AM	1	0	0	1	1	0	0	1	0	1	0	1	3
8:30 AM	3	0	0	3	0	0	0	0	1	2	0	3	6
8:45 AM	2	1	0	3	0	0	0	0	0	0	0	0	3
Total	7	3	0	10	1	2	0	3	3	3	0	6	19
Grand Total	15	5	0	20	2	10	0	12	7	11	0	18	50
Approach %	75.0	25.0	0.0		16.7	83.3	0.0		38.9	61.1	0.0		
Total %	30.0	10.0	0.0	40.0	4.0	20.0	0.0	24.0	14.0	22.0	0.0	36.0	
Exiting Leg Total	13				12				25				50
Buses	7	1	0	8	2	4	0	6	2	3	0	5	19
% Buses	46.7	20.0	0.0	40.0	100.0	40.0	0.0	50.0	28.6	27.3	0.0	27.8	38.0
Exiting Leg Total	5				3				11				19
Single-Unit Trucks	7	4	0	11	0	6	0	6	4	8	0	12	29
% Single-Unit	46.7	80.0	0.0	55.0	0.0	60.0	0.0	50.0	57.1	72.7	0.0	66.7	58.0
Exiting Leg Total	8				8				13				29
Articulated Trucks	1	0	0	1	0	0	0	0	1	0	0	1	2
% Articulated	6.7	0.0	0.0	5.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0	5.6	4.0
Exiting Leg Total	0				1				1				2

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:15 AM	1	0	0	1	1	2	0	3	1	0	0	1	5
7:30 AM	4	0	0	4	0	1	0	1	1	3	0	4	9
7:45 AM	2	1	0	3	0	2	0	2	0	2	0	2	7
8:00 AM	1	2	0	3	0	2	0	2	2	0	0	2	7
Total Volume	8	3	0	11	1	7	0	8	4	5	0	9	28
% Approach Total	72.7	27.3	0.0		12.5	87.5	0.0		44.4	55.6	0.0		
PHF	0.500	0.375	0.000	0.688	0.250	0.875	0.000	0.667	0.500	0.417	0.000	0.563	0.778
Buses	4	0	0	4	1	2	0	3	1	1	0	2	9
Buses %	50.0	0.0	0.0	36.4	100.0	28.6	0.0	37.5	25.0	20.0	0.0	22.2	32.1
Single-Unit Trucks	4	3	0	7	0	5	0	5	3	4	0	7	19
Single-Unit %	50.0	100.0	0.0	63.6	0.0	71.4	0.0	62.5	75.0	80.0	0.0	77.8	67.9
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Buses	4	0	0	4	1	2	0	3	1	1	0	2	9
Single-Unit Trucks	4	3	0	7	0	5	0	5	3	4	0	7	19
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Entering Leg	8	3	0	11	1	7	0	8	4	5	0	9	28
Buses	2				1				6				9
Single-Unit Trucks	4				6				9				19
Articulated Trucks	0				0				0				0
Total Exiting Leg	6				7				15				28

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	4	12	0	16	1	1	0	2	19	18	0	37	55
6:15 AM	11	32	0	43	2	4	0	6	45	31	0	76	125
6:30 AM	10	30	0	40	6	13	0	19	84	36	0	120	179
6:45 AM	7	33	0	40	7	12	0	19	79	51	0	130	189
Total	32	107	0	139	16	30	0	46	227	136	0	363	548
7:00 AM	16	30	0	46	11	6	0	17	94	56	0	150	213
7:15 AM	28	37	0	65	18	20	0	38	76	63	0	139	242
7:30 AM	28	42	0	70	13	17	0	30	61	65	0	126	226
7:45 AM	31	37	0	68	15	17	0	32	58	59	1	118	218
Total	103	146	0	249	57	60	0	117	289	243	1	533	899
8:00 AM	24	66	0	90	22	17	0	39	63	74	0	137	266
8:15 AM	23	40	0	63	18	24	0	42	80	79	0	159	264
8:30 AM	40	38	0	78	18	21	0	39	46	77	0	123	240
8:45 AM	30	53	0	83	24	25	0	49	73	97	0	170	302
Total	117	197	0	314	82	87	0	169	262	327	0	589	1072
Grand Total	252	450	0	702	155	177	0	332	778	706	1	1485	2519
Approach %	35.9	64.1	0.0		46.7	53.3	0.0		52.4	47.5	0.1		
Total %	10.0	17.9	0.0	27.9	6.2	7.0	0.0	13.2	30.9	28.0	0.0	59.0	
Exiting Leg Total	861				1228				430				2519

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
8:00 AM	24	66	0	90	22	17	0	39	63	74	0	137	266
8:15 AM	23	40	0	63	18	24	0	42	80	79	0	159	264
8:30 AM	40	38	0	78	18	21	0	39	46	77	0	123	240
8:45 AM	30	53	0	83	24	25	0	49	73	97	0	170	302
Total Volume	117	197	0	314	82	87	0	169	262	327	0	589	1072
% Approach Total	37.3	62.7	0.0		48.5	51.5	0.0		44.5	55.5	0.0		
PHF	0.731	0.746	0.000	0.872	0.854	0.870	0.000	0.862	0.819	0.843	0.000	0.866	0.887
Entering Leg	117	197	0	314	82	87	0	169	262	327	0	589	1072
Exiting Leg				409				459				204	1072
Total				723				628				793	2144

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Light Goods Vehicle

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	2	0	2	0	1	0	1	6	3	0	9	12
6:15 AM	0	3	0	3	0	1	0	1	7	11	0	18	22
6:30 AM	1	5	0	6	1	3	0	4	11	4	0	15	25
6:45 AM	1	9	0	10	1	2	0	3	14	9	0	23	36
Total	2	19	0	21	2	7	0	9	38	27	0	65	95
7:00 AM	1	0	0	1	0	1	0	1	10	3	0	13	15
7:15 AM	3	3	0	6	3	4	0	7	8	8	0	16	29
7:30 AM	2	9	0	11	1	6	0	7	6	1	0	7	25
7:45 AM	4	0	0	4	0	2	0	2	4	5	0	9	15
Total	10	12	0	22	4	13	0	17	28	17	0	45	84
8:00 AM	4	3	0	7	1	5	0	6	1	1	0	2	15
8:15 AM	2	2	0	4	1	2	0	3	5	4	0	9	16
8:30 AM	4	1	0	5	0	1	0	1	3	5	0	8	14
8:45 AM	3	3	0	6	0	2	0	2	11	3	0	14	22
Total	13	9	0	22	2	10	0	12	20	13	0	33	67
Grand Total	25	40	0	65	8	30	0	38	86	57	0	143	246
Approach %	38.5	61.5	0.0		21.1	78.9	0.0		60.1	39.9	0.0		
Total %	10.2	16.3	0.0	26.4	3.3	12.2	0.0	15.4	35.0	23.2	0.0	58.1	
Exiting Leg Total				65				126				55	246

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:30 AM	1	5	0	6	1	3	0	4	11	4	0	15	25
6:45 AM	1	9	0	10	1	2	0	3	14	9	0	23	36
7:00 AM	1	0	0	1	0	1	0	1	10	3	0	13	15
7:15 AM	3	3	0	6	3	4	0	7	8	8	0	16	29
Total Volume	6	17	0	23	5	10	0	15	43	24	0	67	105
% Approach Total	26.1	73.9	0.0		33.3	66.7	0.0		64.2	35.8	0.0		
PHF	0.500	0.472	0.000	0.575	0.417	0.625	0.000	0.536	0.768	0.667	0.000	0.728	0.729
Entering Leg	6	17	0	23	5	10	0	15	43	24	0	67	105
Exiting Leg				29				60				16	105
Total				52				75				83	210

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	1	0	1	1	0	0	1	2
7:00 AM	0	1	0	1	0	1	0	1	0	1	0	1	3
7:15 AM	1	0	0	1	1	0	0	1	1	0	0	1	3
7:30 AM	3	0	0	3	0	1	0	1	0	0	0	0	4
7:45 AM	0	0	0	0	0	1	0	1	0	1	0	1	2
Total	4	1	0	5	1	3	0	4	1	2	0	3	12
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	1	0	0	1	0	1	0	1	2
8:30 AM	3	0	0	3	0	0	0	0	0	0	0	0	3
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	0	0	3	1	0	0	1	0	1	0	1	5
Grand Total	7	1	0	8	2	4	0	6	2	3	0	5	19
Approach %	87.5	12.5	0.0		33.3	66.7	0.0		40.0	60.0	0.0		
Total %	36.8	5.3	0.0	42.1	10.5	21.1	0.0	31.6	10.5	15.8	0.0	26.3	
Exiting Leg Total	5				3				11				19

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:00 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:00 AM	0	1	0	1	0	1	0	1	0	1	0	1	3
7:15 AM	1	0	0	1	1	0	0	1	1	0	0	1	3
7:30 AM	3	0	0	3	0	1	0	1	0	0	0	0	4
7:45 AM	0	0	0	0	0	1	0	1	0	1	0	1	2
Total Volume	4	1	0	5	1	3	0	4	1	2	0	3	12
% Approach Total	80.0	20.0	0.0		25.0	75.0	0.0		33.3	66.7	0.0		
PHF	0.333	0.250	0.000	0.417	0.250	0.750	0.000	1.000	0.250	0.500	0.000	0.750	0.750
Entering Leg	4	1	0	5	1	3	0	4	1	2	0	3	12
Exiting Leg				3				2				7	12
Total				8				6				10	24

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:30 AM	0	0	0	0	0	1	0	1	1	0	0	1	2
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	1	1	2	0	3	4
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	2	0	2	0	0	0	0	2
7:30 AM	1	0	0	1	0	0	0	0	1	3	0	4	5
7:45 AM	2	1	0	3	0	1	0	1	0	1	0	1	5
Total	3	1	0	4	0	3	0	3	1	4	0	5	12
8:00 AM	1	2	0	3	0	2	0	2	2	0	0	2	7
8:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	2	0	2	2
8:45 AM	2	1	0	3	0	0	0	0	0	0	0	0	3
Total	4	3	0	7	0	2	0	2	2	2	0	4	13
Grand Total	7	4	0	11	0	6	0	6	4	8	0	12	29
Approach %	63.6	36.4	0.0		0.0	100.0	0.0		33.3	66.7	0.0		
Total %	24.1	13.8	0.0	37.9	0.0	20.7	0.0	20.7	13.8	27.6	0.0	41.4	
Exiting Leg Total	8				8				13				29

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
7:15 AM	0	0	0	0	0	2	0	2	0	0	0	0	2
7:30 AM	1	0	0	1	0	0	0	0	1	3	0	4	5
7:45 AM	2	1	0	3	0	1	0	1	0	1	0	1	5
8:00 AM	1	2	0	3	0	2	0	2	2	0	0	2	7
Total Volume	4	3	0	7	0	5	0	5	3	4	0	7	19
% Approach Total	57.1	42.9	0.0		0.0	100.0	0.0		42.9	57.1	0.0		
PHF	0.500	0.375	0.000	0.583	0.000	0.625	0.000	0.625	0.375	0.333	0.000	0.438	0.679
Entering Leg	4	3	0	7	0	5	0	5	3	4	0	7	19
Exiting Leg				4				6				9	19
Total				11				11				16	38

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	1	0	0	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	1	1
Grand Total	1	0	0	1	0	0	0	0	1	0	0	1	2
Approach %	100.0	0.0	0.0		0.0	0.0	0.0		100.0	0.0	0.0		
Total %	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	50.0	
Exiting Leg Total	0				1				1				2

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:15 AM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total Volume	1	0	0	1	0	0	0	0	0	0	0	0	1
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0		
PHF	0.250	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250
Entering Leg	1	0	0	1	0	0	0	0	0	0	0	0	1
Exiting Leg				0				0				1	1
Total				1				0				1	2

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Old Bedford Road							Lexington Road							Lexington Road							Total
	from North							from East							from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total				
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	3		
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	3		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1		
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2		
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	3		
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	6	6		
Approach %	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0		33.3	66.7	0.0	0.0	0.0				
Total %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	33.3	66.7	0.0	0.0	0.0	100.0			
Exiting Leg Total	4							2							0							6

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Old Bedford Road						Lexington Road						Lexington Road						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	3	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	6	6	
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		33.3	66.7	0.0	0.0	0.0			
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.500	0.000	0.000	0.000	0.500	0.500	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	6	6	
Exiting Leg	4						2						0						0	6
Total	4						2						6						12	

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Old Bedford Road						Lexington Road						Lexington Road						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Old Bedford Road						Lexington Road						Lexington Road						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0
Total	0						0						0						0

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	35	12	0	47	34	75	0	109	26	30	0	56	212
3:15 PM	42	22	0	64	36	98	0	134	35	31	0	66	264
3:30 PM	27	17	0	44	41	97	0	138	25	39	0	64	246
3:45 PM	36	16	0	52	51	117	0	168	29	40	0	69	289
Total	140	67	0	207	162	387	0	549	115	140	0	255	1011
4:00 PM	38	7	0	45	58	83	0	141	24	36	0	60	246
4:15 PM	34	22	0	56	65	92	0	157	26	27	0	53	266
4:30 PM	25	15	0	40	99	111	0	210	19	24	0	43	293
4:45 PM	29	20	0	49	106	67	0	173	16	40	0	56	278
Total	126	64	0	190	328	353	0	681	85	127	0	212	1083
5:00 PM	42	30	0	72	75	81	0	156	30	29	0	59	287
5:15 PM	33	31	0	64	63	110	0	173	22	38	1	61	298
5:30 PM	46	15	0	61	57	107	0	164	28	22	0	50	275
5:45 PM	41	20	0	61	75	111	0	186	17	50	0	67	314
Total	162	96	0	258	270	409	0	679	97	139	1	237	1174
Grand Total	428	227	0	655	760	1149	0	1909	297	406	1	704	3268
Approach %	65.3	34.7	0.0		39.8	60.2	0.0		42.2	57.7	0.1		
Total %	13.1	6.9	0.0	20.0	23.3	35.2	0.0	58.4	9.1	12.4	0.0	21.5	
Exiting Leg Total				1166				524				1578	3268
Cars	421	221	0	642	756	1139	0	1895	288	396	1	685	3222
% Cars	98.4	97.4	0.0	98.0	99.5	99.1	0.0	99.3	97.0	97.5	100.0	97.3	98.6
Exiting Leg Total				1152				509				1561	3222
Heavy Vehicles	7	6	0	13	4	10	0	14	9	10	0	19	46
% Heavy Vehicles	1.6	2.6	0.0	2.0	0.5	0.9	0.0	0.7	3.0	2.5	0.0	2.7	1.4
Exiting Leg Total				14				15				17	46

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

5:00 PM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
5:00 PM	42	30	0	72	75	81	0	156	30	29	0	59	287
5:15 PM	33	31	0	64	63	110	0	173	22	38	1	61	298
5:30 PM	46	15	0	61	57	107	0	164	28	22	0	50	275
5:45 PM	41	20	0	61	75	111	0	186	17	50	0	67	314
Total Volume	162	96	0	258	270	409	0	679	97	139	1	237	1174
% Approach Total	62.8	37.2	0.0		39.8	60.2	0.0		40.9	58.6	0.4		
PHF	0.880	0.774	0.000	0.896	0.900	0.921	0.000	0.913	0.808	0.695	0.250	0.884	0.935
Cars	162	93	0	255	270	408	0	678	94	137	1	232	1165
Cars %	100.0	96.9	0.0	98.8	100.0	99.8	0.0	99.9	96.9	98.6	100.0	97.9	99.2
Heavy Vehicles	0	3	0	3	0	1	0	1	3	2	0	5	9
Heavy Vehicles %	0.0	3.1	0.0	1.2	0.0	0.2	0.0	0.1	3.1	1.4	0.0	2.1	0.8
Cars Enter Leg	162	93	0	255	270	408	0	678	94	137	1	232	1165
Heavy Enter Leg	0	3	0	3	0	1	0	1	3	2	0	5	9
Total Entering Leg	162	96	0	258	270	409	0	679	97	139	1	237	1174
Cars Exiting Leg				407				187				571	1165
Heavy Exiting Leg				2				6				1	9
Total Exiting Leg				409				193				572	1174

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**



Class: **Cars-Combined (Motorcycles, Cars, Light Goods)**

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	31	12	0	43	33	74	0	107	25	30	0	55	205
3:15 PM	42	20	0	62	36	98	0	134	34	30	0	64	260
3:30 PM	27	17	0	44	40	94	0	134	25	38	0	63	241
3:45 PM	36	16	0	52	50	115	0	165	29	37	0	66	283
Total	136	65	0	201	159	381	0	540	113	135	0	248	989
4:00 PM	35	7	0	42	57	83	0	140	23	34	0	57	239
4:15 PM	34	21	0	55	65	90	0	155	24	27	0	51	261
4:30 PM	25	15	0	40	99	111	0	210	19	24	0	43	293
4:45 PM	29	20	0	49	106	66	0	172	15	39	0	54	275
Total	123	63	0	186	327	350	0	677	81	124	0	205	1068
5:00 PM	42	29	0	71	75	81	0	156	28	28	0	56	283
5:15 PM	33	29	0	62	63	109	0	172	21	38	1	60	294
5:30 PM	46	15	0	61	57	107	0	164	28	22	0	50	275
5:45 PM	41	20	0	61	75	111	0	186	17	49	0	66	313
Total	162	93	0	255	270	408	0	678	94	137	1	232	1165
Grand Total	421	221	0	642	756	1139	0	1895	288	396	1	685	3222
Approach %	65.6	34.4	0.0		39.9	60.1	0.0		42.0	57.8	0.1		
Total %	13.1	6.9	0.0	19.9	23.5	35.4	0.0	58.8	8.9	12.3	0.0	21.3	
Exiting Leg Total				1152				509				1561	3222

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

5:00 PM	Old Bedford Road					Lexington Road					Lexington Road					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total		Thru	Left	U-Turn	Total		
5:00 PM	42	29	0	71	75	81	0	156	28	28	0	56	283			
5:15 PM	33	29	0	62	63	109	0	172	21	38	1	60	294			
5:30 PM	46	15	0	61	57	107	0	164	28	22	0	50	275			
5:45 PM	41	20	0	61	75	111	0	186	17	49	0	66	313			
Total Volume	162	93	0	255	270	408	0	678	94	137	1	232	1165			
% Approach Total	63.5	36.5	0.0		39.8	60.2	0.0		40.5	59.1	0.4					
PHF	0.880	0.802	0.000	0.898	0.900	0.919	0.000	0.911	0.839	0.699	0.250	0.879	0.931			
Entering Leg	162	93	0	255	270	408	0	678	94	137	1	232	1165			
Exiting Leg				407				187				571	1165			
Total				662				865				803	2330			

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**



Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	4	0	0	4	1	1	0	2	1	0	0	1	7
3:15 PM	0	2	0	2	0	0	0	0	1	1	0	2	4
3:30 PM	0	0	0	0	1	3	0	4	0	1	0	1	5
3:45 PM	0	0	0	0	1	2	0	3	0	3	0	3	6
Total	4	2	0	6	3	6	0	9	2	5	0	7	22
4:00 PM	3	0	0	3	1	0	0	1	1	2	0	3	7
4:15 PM	0	1	0	1	0	2	0	2	2	0	0	2	5
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	1	0	1	1	1	0	2	3
Total	3	1	0	4	1	3	0	4	4	3	0	7	15
5:00 PM	0	1	0	1	0	0	0	0	2	1	0	3	4
5:15 PM	0	2	0	2	0	1	0	1	1	0	0	1	4
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	3	0	3	0	1	0	1	3	2	0	5	9
Grand Total	7	6	0	13	4	10	0	14	9	10	0	19	46
Approach %	53.8	46.2	0.0		28.6	71.4	0.0		47.4	52.6	0.0		
Total %	15.2	13.0	0.0	28.3	8.7	21.7	0.0	30.4	19.6	21.7	0.0	41.3	
Exiting Leg Total	14				15				17				46
Buses	6	1	0	7	1	3	0	4	2	7	0	9	20
% Buses	85.7	16.7	0.0	53.8	25.0	30.0	0.0	28.6	22.2	70.0	0.0	47.4	43.5
Exiting Leg Total	8				3				9				20
Single-Unit Trucks	1	3	0	4	2	7	0	9	6	2	0	8	21
% Single-Unit	14.3	50.0	0.0	30.8	50.0	70.0	0.0	64.3	66.7	20.0	0.0	42.1	45.7
Exiting Leg Total	4				9				8				21
Articulated Trucks	0	2	0	2	1	0	0	1	1	1	0	2	5
% Articulated	0.0	33.3	0.0	15.4	25.0	0.0	0.0	7.1	11.1	10.0	0.0	10.5	10.9
Exiting Leg Total	2				3				0				5

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:30 PM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:30 PM	0	0	0	0	1	3	0	4	0	1	0	1	5
3:45 PM	0	0	0	0	1	2	0	3	0	3	0	3	6
4:00 PM	3	0	0	3	1	0	0	1	1	2	0	3	7
4:15 PM	0	1	0	1	0	2	0	2	2	0	0	2	5
Total Volume	3	1	0	4	3	7	0	10	3	6	0	9	23
% Approach Total	75.0	25.0	0.0		30.0	70.0	0.0		33.3	66.7	0.0		
PHF	0.250	0.250	0.000	0.333	0.750	0.583	0.000	0.625	0.375	0.500	0.000	0.750	0.821
Buses	2	0	0	2	0	1	0	1	1	4	0	5	8
Buses %	66.7	0.0	0.0	50.0	0.0	14.3	0.0	10.0	33.3	66.7	0.0	55.6	34.8
Single-Unit Trucks	1	1	0	2	2	6	0	8	2	1	0	3	13
Single-Unit %	33.3	100.0	0.0	50.0	66.7	85.7	0.0	80.0	66.7	16.7	0.0	33.3	56.5
Articulated Trucks	0	0	0	0	1	0	0	1	0	1	0	1	2
Articulated %	0.0	0.0	0.0	0.0	33.3	0.0	0.0	10.0	0.0	16.7	0.0	11.1	8.7
Buses	2	0	0	2	0	1	0	1	1	4	0	5	8
Single-Unit Trucks	1	1	0	2	2	6	0	8	2	1	0	3	13
Articulated Trucks	0	0	0	0	1	0	0	1	0	1	0	1	2
Total Entering Leg	3	1	0	4	3	7	0	10	3	6	0	9	23
Buses				4				1				3	8
Single-Unit Trucks				3				3				7	13
Articulated Trucks				2				0				0	2
Total Exiting Leg				9				4				10	23

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	27	9	0	36	31	60	0	91	24	26	0	50	177
3:15 PM	40	20	0	60	31	84	0	115	28	27	0	55	230
3:30 PM	24	15	0	39	31	82	0	113	21	34	0	55	207
3:45 PM	30	15	0	45	39	99	0	138	27	36	0	63	246
Total	121	59	0	180	132	325	0	457	100	123	0	223	860
4:00 PM	31	6	0	37	53	72	0	125	19	31	0	50	212
4:15 PM	34	17	0	51	56	79	0	135	22	25	0	47	233
4:30 PM	25	12	0	37	85	105	0	190	19	22	0	41	268
4:45 PM	28	18	0	46	97	62	0	159	15	33	0	48	253
Total	118	53	0	171	291	318	0	609	75	111	0	186	966
5:00 PM	40	26	0	66	74	70	0	144	26	25	0	51	261
5:15 PM	31	28	0	59	61	103	0	164	20	34	1	55	278
5:30 PM	41	13	0	54	56	97	0	153	26	19	0	45	252
5:45 PM	41	20	0	61	73	108	0	181	15	45	0	60	302
Total	153	87	0	240	264	378	0	642	87	123	1	211	1093
Grand Total	392	199	0	591	687	1021	0	1708	262	357	1	620	2919
Approach %	66.3	33.7	0.0		40.2	59.8	0.0		42.3	57.6	0.2		
Total %	13.4	6.8	0.0	20.2	23.5	35.0	0.0	58.5	9.0	12.2	0.0	21.2	
Exiting Leg Total				1044				461				1414	2919

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

5:00 PM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
5:00 PM	40	26	0	66	74	70	0	144	26	25	0	51	261
5:15 PM	31	28	0	59	61	103	0	164	20	34	1	55	278
5:30 PM	41	13	0	54	56	97	0	153	26	19	0	45	252
5:45 PM	41	20	0	61	73	108	0	181	15	45	0	60	302
Total Volume	153	87	0	240	264	378	0	642	87	123	1	211	1093
% Approach Total	63.8	36.3	0.0		41.1	58.9	0.0		41.2	58.3	0.5		
PHF	0.933	0.777	0.000	0.909	0.892	0.875	0.000	0.887	0.837	0.683	0.250	0.879	0.905
Entering Leg	153	87	0	240	264	378	0	642	87	123	1	211	1093
Exiting Leg				387				174				532	1093
Total				627				816				743	2186

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Light Goods Vehicle

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	4	3	0	7	2	14	0	16	1	4	0	5	28
3:15 PM	2	0	0	2	5	14	0	19	6	3	0	9	30
3:30 PM	3	1	0	4	9	12	0	21	4	4	0	8	33
3:45 PM	6	1	0	7	11	16	0	27	2	1	0	3	37
Total	15	5	0	20	27	56	0	83	13	12	0	25	128
4:00 PM	4	1	0	5	4	11	0	15	4	3	0	7	27
4:15 PM	0	4	0	4	9	11	0	20	2	2	0	4	28
4:30 PM	0	3	0	3	14	6	0	20	0	2	0	2	25
4:45 PM	1	2	0	3	9	4	0	13	0	6	0	6	22
Total	5	10	0	15	36	32	0	68	6	13	0	19	102
5:00 PM	2	3	0	5	1	11	0	12	2	3	0	5	22
5:15 PM	2	1	0	3	2	6	0	8	1	4	0	5	16
5:30 PM	5	2	0	7	1	10	0	11	2	3	0	5	23
5:45 PM	0	0	0	0	2	3	0	5	2	4	0	6	11
Total	9	6	0	15	6	30	0	36	7	14	0	21	72
Grand Total	29	21	0	50	69	118	0	187	26	39	0	65	302
Approach %	58.0	42.0	0.0		36.9	63.1	0.0		40.0	60.0	0.0		
Total %	9.6	7.0	0.0	16.6	22.8	39.1	0.0	61.9	8.6	12.9	0.0	21.5	
Exiting Leg Total				108				47				147	302

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Bedford Road					Lexington Road					Lexington Road					Total	
	from North					from East					from West						
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total		Thru	Left	U-Turn	Total			
3:00 PM	4	3	0	7		2	14	0	16		1	4	0	5		28	
3:15 PM	2	0	0	2		5	14	0	19		6	3	0	9		30	
3:30 PM	3	1	0	4		9	12	0	21		4	4	0	8		33	
3:45 PM	6	1	0	7		11	16	0	27		2	1	0	3		37	
Total Volume	15	5	0	20		27	56	0	83		13	12	0	25		128	
% Approach Total	75.0	25.0	0.0			32.5	67.5	0.0			52.0	48.0	0.0				
PHF	0.625	0.417	0.000	0.714		0.614	0.875	0.000	0.769		0.542	0.750	0.000	0.694		0.865	
Entering Leg	15	5	0	20		27	56	0	83		13	12	0	25		128	
Exiting Leg						39	18					71					128
Total						59	101					96					256

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Old Bedford Road					Lexington Road					Lexington Road					Total
	from North					from East					from West					
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total				
3:00 PM	4	0	0	4	1	1	0	2	0	0	0	0	6			
3:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	1			
3:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	1			
3:45 PM	0	0	0	0	0	0	0	0	0	3	0	3	3			
Total	4	1	0	5	1	2	0	3	0	3	0	3	11			
4:00 PM	2	0	0	2	0	0	0	0	0	1	0	1	3			
4:15 PM	0	0	0	0	0	0	0	0	1	0	0	1	1			
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0			
4:45 PM	0	0	0	0	0	1	0	1	0	1	0	1	2			
Total	2	0	0	2	0	1	0	1	1	2	0	3	6			
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1			
5:15 PM	0	0	0	0	0	0	0	0	1	0	0	1	1			
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1			
Total	0	0	0	0	0	0	0	0	1	2	0	3	3			
Grand Total	6	1	0	7	1	3	0	4	2	7	0	9	20			
Approach %	85.7	14.3	0.0		25.0	75.0	0.0		22.2	77.8	0.0					
Total %	30.0	5.0	0.0	35.0	5.0	15.0	0.0	20.0	10.0	35.0	0.0	45.0				
Exiting Leg Total	8				3				9				20			

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Bedford Road					Lexington Road				Lexington Road				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	4	0	0	4		1	1	0	2	0	0	0	0	6
3:15 PM	0	1	0	1		0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0		0	1	0	1	0	0	0	0	1
3:45 PM	0	0	0	0		0	0	0	0	0	3	0	3	3
Total Volume	4	1	0	5		1	2	0	3	0	3	0	3	11
% Approach Total	80.0	20.0	0.0			33.3	66.7	0.0		0.0	100.0	0.0		
PHF	0.250	0.250	0.000	0.313		0.250	0.500	0.000	0.375	0.000	0.250	0.000	0.250	0.458
Entering Leg	4	1	0	5		1	2	0	3	0	3	0	3	11
Exiting Leg	4					1				6				11
Total	9					4				9				22

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
3:15 PM	0	0	0	0	0	0	0	0	1	1	0	2	2
3:30 PM	0	0	0	0	1	2	0	3	0	0	0	0	3
3:45 PM	0	0	0	0	1	2	0	3	0	0	0	0	3
Total	0	0	0	0	2	4	0	6	2	1	0	3	9
4:00 PM	1	0	0	1	0	0	0	0	1	1	0	2	3
4:15 PM	0	1	0	1	0	2	0	2	1	0	0	1	4
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	1	1	0	2	0	2	0	2	3	1	0	4	8
5:00 PM	0	1	0	1	0	0	0	0	1	0	0	1	2
5:15 PM	0	1	0	1	0	1	0	1	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	2	0	1	0	1	1	0	0	1	4
Grand Total	1	3	0	4	2	7	0	9	6	2	0	8	21
Approach %	25.0	75.0	0.0		22.2	77.8	0.0		75.0	25.0	0.0		
Total %	4.8	14.3	0.0	19.0	9.5	33.3	0.0	42.9	28.6	9.5	0.0	38.1	
Exiting Leg Total	4				9				8				21

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:30 PM	Old Bedford Road					Lexington Road				Lexington Road				Total
	from North					from East				from West				
	Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:30 PM	0	0	0	0	0	1	2	0	3	0	0	0	0	3
3:45 PM	0	0	0	0	0	1	2	0	3	0	0	0	0	3
4:00 PM	1	0	0	1	0	0	0	0	0	1	1	0	2	3
4:15 PM	0	1	0	1	0	2	0	2	1	0	0	1	4	
Total Volume	1	1	0	2	2	6	0	8	2	1	0	3	13	
% Approach Total	50.0	50.0	0.0		25.0	75.0	0.0		66.7	33.3	0.0			
PHF	0.250	0.250	0.000	0.500	0.500	0.750	0.000	0.667	0.500	0.250	0.000	0.375	0.813	
Entering Leg	1	1	0	2	2	6	0	8	2	1	0	3	13	
Exiting Leg				3				3				7	13	
Total				5				11				10	26	

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	1	0	0	0	0	0	1	0	1	2
4:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	0	1	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
5:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	1	0	0	0	0	1	0	0	1	2
Grand Total	0	2	0	2	1	0	0	1	1	1	0	2	5
Approach %	0.0	100.0	0.0		100.0	0.0	0.0		50.0	50.0	0.0		
Total %	0.0	40.0	0.0	40.0	20.0	0.0	0.0	20.0	20.0	20.0	0.0	40.0	
Exiting Leg Total	2				3				0				5

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:15 PM	Old Bedford Road				Lexington Road				Lexington Road				Total
	from North				from East				from West				
	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	
3:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
Total Volume	0	1	0	1	1	0	0	1	0	1	0	1	3
% Approach Total	0.0	100.0	0.0		100.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.000	0.250	0.000	0.250	0.250	0.000	0.000	0.250	0.000	0.250	0.000	0.250	0.750
Entering Leg	0	1	0	1	1	0	0	1	0	1	0	1	3
Exiting Leg				2				1				0	3
Total				3				2				1	6

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Old Bedford Road						Lexington Road						Lexington Road						Total	
	from North						from East						from West							
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
3:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:45 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	2	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	0	2	4
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
5:15 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1
5:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	1	0	1	0	0	0	1	0	2	0	0	0	0	2	4
Grand Total	4	0	0	0	0	4	0	1	0	0	0	1	0	4	0	0	0	4	9	
Approach %	100.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0			
Total %	44.4	0.0	0.0	0.0	0.0	44.4	0.0	11.1	0.0	0.0	0.0	11.1	0.0	44.4	0.0	0.0	0.0	44.4		
Exiting Leg Total	4						0						5						9	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Bedford Road						Lexington Road						Lexington Road						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
3:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
3:45 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	2	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	2	4
% Approach Total	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		
PHF	0.500	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.500
Entering Leg	2	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	2	4
Exiting Leg	2						0						2						4
Total	4						0						4						8

PDI File #: **176038 G**
 Location: **N: Old Bedford Road**
 Location: **E: Lexington Road W: Lexington Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Old Bedford Road						Lexington Road						Lexington Road						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Bedford Road						Lexington Road						Lexington Road						Total
	from North						from East						from West						
	Right	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	U-Turn	CW-SB	CW-NB	Total	Thru	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0
Total	0						0						0						0

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	12	13	0	25	1	2	0	3	21	1	0	22	50
6:15 AM	43	13	0	56	2	3	0	5	34	6	0	40	101
6:30 AM	38	16	0	54	3	4	0	7	37	12	0	49	110
6:45 AM	48	31	0	79	0	0	0	0	49	10	0	59	138
Total	141	73	0	214	6	9	0	15	141	29	0	170	399
7:00 AM	48	41	0	89	2	8	0	10	53	23	0	76	175
7:15 AM	56	41	0	97	3	7	0	10	54	28	0	82	189
7:30 AM	76	33	0	109	3	8	0	11	60	22	0	82	202
7:45 AM	62	38	0	100	1	8	0	9	55	29	0	84	193
Total	242	153	0	395	9	31	0	40	222	102	0	324	759
8:00 AM	85	33	0	118	7	12	0	19	49	42	0	91	228
8:15 AM	63	32	0	95	3	6	0	9	57	38	0	95	199
8:30 AM	85	36	0	121	4	6	0	10	50	40	0	90	221
8:45 AM	76	34	0	110	14	15	0	29	64	47	0	111	250
Total	309	135	0	444	28	39	0	67	220	167	0	387	898
Grand Total	692	361	0	1053	43	79	0	122	583	298	0	881	2056
Approach %	65.7	34.3	0.0		35.2	64.8	0.0		66.2	33.8	0.0		
Total %	33.7	17.6	0.0	51.2	2.1	3.8	0.0	5.9	28.4	14.5	0.0	42.9	
Exiting Leg Total				341				944				771	2056
Cars	678	357	0	1035	38	73	0	111	578	292	0	870	2016
% Cars	98.0	98.9	0.0	98.3	88.4	92.4	0.0	91.0	99.1	98.0	0.0	98.8	98.1
Exiting Leg Total				330				935				751	2016
Heavy Vehicles	14	4	0	18	5	6	0	11	5	6	0	11	40
% Heavy Vehicles	2.0	1.1	0.0	1.7	11.6	7.6	0.0	9.0	0.9	2.0	0.0	1.2	1.9
Exiting Leg Total				11				9				20	40

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
8:00 AM	85	33	0	118	7	12	0	19	49	42	0	91	228
8:15 AM	63	32	0	95	3	6	0	9	57	38	0	95	199
8:30 AM	85	36	0	121	4	6	0	10	50	40	0	90	221
8:45 AM	76	34	0	110	14	15	0	29	64	47	0	111	250
Total Volume	309	135	0	444	28	39	0	67	220	167	0	387	898
% Approach Total	69.6	30.4	0.0		41.8	58.2	0.0		56.8	43.2	0.0		
PHF	0.909	0.938	0.000	0.917	0.500	0.650	0.000	0.578	0.859	0.888	0.000	0.872	0.898
Cars	302	135	0	437	26	35	0	61	217	166	0	383	881
Cars %	97.7	100.0	0.0	98.4	92.9	89.7	0.0	91.0	98.6	99.4	0.0	99.0	98.1
Heavy Vehicles	7	0	0	7	2	4	0	6	3	1	0	4	17
Heavy Vehicles %	2.3	0.0	0.0	1.6	7.1	10.3	0.0	9.0	1.4	0.6	0.0	1.0	1.9
Cars Enter Leg	302	135	0	437	26	35	0	61	217	166	0	383	881
Heavy Enter Leg	7	0	0	7	2	4	0	6	3	1	0	4	17
Total Entering Leg	309	135	0	444	28	39	0	67	220	167	0	387	898
Cars Exiting Leg				192				352				337	881
Heavy Exiting Leg				3				3				11	17
Total Exiting Leg				195				355				348	898

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	12	13	0	25	1	2	0	3	21	0	0	21	49
6:15 AM	43	13	0	56	2	3	0	5	34	5	0	39	100
6:30 AM	38	16	0	54	1	4	0	5	37	12	0	49	108
6:45 AM	47	31	0	78	0	0	0	0	49	10	0	59	137
Total	140	73	0	213	4	9	0	13	141	27	0	168	394
7:00 AM	48	40	0	88	2	7	0	9	52	23	0	75	172
7:15 AM	56	40	0	96	2	6	0	8	53	28	0	81	185
7:30 AM	72	33	0	105	3	8	0	11	60	22	0	82	198
7:45 AM	60	36	0	96	1	8	0	9	55	26	0	81	186
Total	236	149	0	385	8	29	0	37	220	99	0	319	741
8:00 AM	83	33	0	116	7	11	0	18	48	42	0	90	224
8:15 AM	62	32	0	94	3	6	0	9	56	38	0	94	197
8:30 AM	83	36	0	119	3	5	0	8	49	39	0	88	215
8:45 AM	74	34	0	108	13	13	0	26	64	47	0	111	245
Total	302	135	0	437	26	35	0	61	217	166	0	383	881
Grand Total	678	357	0	1035	38	73	0	111	578	292	0	870	2016
Approach %	65.5	34.5	0.0		34.2	65.8	0.0		66.4	33.6	0.0		
Total %	33.6	17.7	0.0	51.3	1.9	3.6	0.0	5.5	28.7	14.5	0.0	43.2	
Exiting Leg Total				330				935				751	2016

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Bedford Road				Virginia Road					Old Bedford Road				Total
	from North				from East					from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total		
8:00 AM	83	33	0	116	7	11	0	18	48	42	0	90	224	
8:15 AM	62	32	0	94	3	6	0	9	56	38	0	94	197	
8:30 AM	83	36	0	119	3	5	0	8	49	39	0	88	215	
8:45 AM	74	34	0	108	13	13	0	26	64	47	0	111	245	
Total Volume	302	135	0	437	26	35	0	61	217	166	0	383	881	
% Approach Total	69.1	30.9	0.0		42.6	57.4	0.0		56.7	43.3	0.0			
PHF	0.910	0.938	0.000	0.918	0.500	0.673	0.000	0.587	0.848	0.883	0.000	0.863	0.899	
Entering Leg	302	135	0	437	26	35	0	61	217	166	0	383	881	
Exiting Leg				192				352				337	881	
Total				629				413				720	1762	

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:30 AM	0	0	0	0	2	0	0	2	0	0	0	0	2
6:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total	1	0	0	1	2	0	0	2	0	2	0	2	5
7:00 AM	0	1	0	1	0	1	0	1	1	0	0	1	3
7:15 AM	0	1	0	1	1	1	0	2	1	0	0	1	4
7:30 AM	4	0	0	4	0	0	0	0	0	0	0	0	4
7:45 AM	2	2	0	4	0	0	0	0	0	3	0	3	7
Total	6	4	0	10	1	2	0	3	2	3	0	5	18
8:00 AM	2	0	0	2	0	1	0	1	1	0	0	1	4
8:15 AM	1	0	0	1	0	0	0	0	1	0	0	1	2
8:30 AM	2	0	0	2	1	1	0	2	1	1	0	2	6
8:45 AM	2	0	0	2	1	2	0	3	0	0	0	0	5
Total	7	0	0	7	2	4	0	6	3	1	0	4	17
Grand Total	14	4	0	18	5	6	0	11	5	6	0	11	40
Approach %	77.8	22.2	0.0		45.5	54.5	0.0		45.5	54.5	0.0		
Total %	35.0	10.0	0.0	45.0	12.5	15.0	0.0	27.5	12.5	15.0	0.0	27.5	
Exiting Leg Total	11				9				20				40
Buses	6	1	0	7	1	2	0	3	3	2	0	5	15
% Buses	42.9	25.0	0.0	38.9	20.0	33.3	0.0	27.3	60.0	33.3	0.0	45.5	37.5
Exiting Leg Total	3				4				8				15
Single-Unit Trucks	8	3	0	11	4	3	0	7	2	4	0	6	24
% Single-Unit	57.1	75.0	0.0	61.1	80.0	50.0	0.0	63.6	40.0	66.7	0.0	54.5	60.0
Exiting Leg Total	8				5				11				24
Articulated Trucks	0	0	0	0	0	1	0	1	0	0	0	0	1
% Articulated	0.0	0.0	0.0	0.0	0.0	16.7	0.0	9.1	0.0	0.0	0.0	0.0	2.5
Exiting Leg Total	0				0				1				1

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
7:15 AM	0	1	0	1	1	1	0	2	1	0	0	1	4
7:30 AM	4	0	0	4	0	0	0	0	0	0	0	0	4
7:45 AM	2	2	0	4	0	0	0	0	0	3	0	3	7
8:00 AM	2	0	0	2	0	1	0	1	1	0	0	1	4
Total Volume	8	3	0	11	1	2	0	3	2	3	0	5	19
% Approach Total	72.7	27.3	0.0		33.3	66.7	0.0		40.0	60.0	0.0		
PHF	0.500	0.375	0.000	0.688	0.250	0.500	0.000	0.375	0.500	0.250	0.000	0.417	0.679
Buses	3	1	0	4	1	1	0	2	1	1	0	2	8
Buses %	37.5	33.3	0.0	36.4	100.0	50.0	0.0	66.7	50.0	33.3	0.0	40.0	42.1
Single-Unit Trucks	5	2	0	7	0	1	0	1	1	2	0	3	11
Single-Unit %	62.5	66.7	0.0	63.6	0.0	50.0	0.0	33.3	50.0	66.7	0.0	60.0	57.9
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Buses	3	1	0	4	1	1	0	2	1	1	0	2	8
Single-Unit Trucks	5	2	0	7	0	1	0	1	1	2	0	3	11
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Entering Leg	8	3	0	11	1	2	0	3	2	3	0	5	19
Buses	2				2				4				8
Single-Unit Trucks	2				3				6				11
Articulated Trucks	0				0				0				0
Total Exiting Leg	4				5				10				19

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	10	12	0	22	1	2	0	3	18	0	0	18	43
6:15 AM	40	11	0	51	2	3	0	5	23	4	0	27	83
6:30 AM	35	15	0	50	1	4	0	5	33	11	0	44	99
6:45 AM	41	30	0	71	0	0	0	0	41	9	0	50	121
Total	126	68	0	194	4	9	0	13	115	24	0	139	346
7:00 AM	47	35	0	82	2	6	0	8	51	21	0	72	162
7:15 AM	50	38	0	88	1	5	0	6	51	25	0	76	170
7:30 AM	61	31	0	92	3	7	0	10	58	22	0	80	182
7:45 AM	55	32	0	87	0	8	0	8	55	25	0	80	175
Total	213	136	0	349	6	26	0	32	215	93	0	308	689
8:00 AM	76	31	0	107	5	11	0	16	47	37	0	84	207
8:15 AM	59	30	0	89	3	5	0	8	55	37	0	92	189
8:30 AM	79	32	0	111	3	4	0	7	45	38	0	83	201
8:45 AM	71	30	0	101	13	12	0	25	60	47	0	107	233
Total	285	123	0	408	24	32	0	56	207	159	0	366	830
Grand Total	624	327	0	951	34	67	0	101	537	276	0	813	1865
Approach %	65.6	34.4	0.0		33.7	66.3	0.0		66.1	33.9	0.0		
Total %	33.5	17.5	0.0	51.0	1.8	3.6	0.0	5.4	28.8	14.8	0.0	43.6	
Exiting Leg Total				310				864				691	1865

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
8:00 AM	76	31	0	107	5	11	0	16	47	37	0	84	207
8:15 AM	59	30	0	89	3	5	0	8	55	37	0	92	189
8:30 AM	79	32	0	111	3	4	0	7	45	38	0	83	201
8:45 AM	71	30	0	101	13	12	0	25	60	47	0	107	233
Total Volume	285	123	0	408	24	32	0	56	207	159	0	366	830
% Approach Total	69.9	30.1	0.0		42.9	57.1	0.0		56.6	43.4	0.0		
PHF	0.902	0.961	0.000	0.919	0.462	0.667	0.000	0.560	0.863	0.846	0.000	0.855	0.891
Entering Leg	285	123	0	408	24	32	0	56	207	159	0	366	830
Exiting Leg				183				330				317	830
Total				591				386				683	1660

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Light Goods Vehicle

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	2	1	0	3	0	0	0	0	3	0	0	3	6
6:15 AM	3	2	0	5	0	0	0	0	11	1	0	12	17
6:30 AM	3	1	0	4	0	0	0	0	4	1	0	5	9
6:45 AM	6	1	0	7	0	0	0	0	8	1	0	9	16
Total	14	5	0	19	0	0	0	0	26	3	0	29	48
7:00 AM	1	5	0	6	0	1	0	1	1	1	0	2	9
7:15 AM	6	2	0	8	1	1	0	2	2	3	0	5	15
7:30 AM	11	2	0	13	0	1	0	1	2	0	0	2	16
7:45 AM	5	4	0	9	1	0	0	1	0	1	0	1	11
Total	23	13	0	36	2	3	0	5	5	5	0	10	51
8:00 AM	7	2	0	9	2	0	0	2	1	5	0	6	17
8:15 AM	3	2	0	5	0	1	0	1	1	1	0	2	8
8:30 AM	3	4	0	7	0	1	0	1	4	1	0	5	13
8:45 AM	3	4	0	7	0	1	0	1	4	0	0	4	12
Total	16	12	0	28	2	3	0	5	10	7	0	17	50
Grand Total	53	30	0	83	4	6	0	10	41	15	0	56	149
Approach %	63.9	36.1	0.0		40.0	60.0	0.0		73.2	26.8	0.0		
Total %	35.6	20.1	0.0	55.7	2.7	4.0	0.0	6.7	27.5	10.1	0.0	37.6	
Exiting Leg Total				19				71				59	149

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
7:15 AM	6	2	0	8	1	1	0	2	2	3	0	5	15
7:30 AM	11	2	0	13	0	1	0	1	2	0	0	2	16
7:45 AM	5	4	0	9	1	0	0	1	0	1	0	1	11
8:00 AM	7	2	0	9	2	0	0	2	1	5	0	6	17
Total Volume	29	10	0	39	4	2	0	6	5	9	0	14	59
% Approach Total	74.4	25.6	0.0		66.7	33.3	0.0		35.7	64.3	0.0		
PHF	0.659	0.625	0.000	0.750	0.500	0.500	0.000	0.750	0.625	0.450	0.000	0.583	0.868
Entering Leg	29	10	0	39	4	2	0	6	5	9	0	14	59
Exiting Leg				13				15				31	59
Total				52				21				45	118

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Old Bedford Road					Virginia Road					Old Bedford Road					Total
	from North					from East					from South					
	Thru	Left	U-Turn	Total		Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total		
6:00 AM	0	0	0	0		0	0	0	0		0	0	0	0		0
6:15 AM	0	0	0	0		0	0	0	0		0	0	0	0		0
6:30 AM	0	0	0	0		0	0	0	0		0	0	0	0		0
6:45 AM	1	0	0	1		0	0	0	0		0	0	0	0		1
Total	1	0	0	1		0	0	0	0		0	0	0	0		1
7:00 AM	0	0	0	0		0	0	0	0		1	0	0	1		1
7:15 AM	0	1	0	1		1	1	0	2		1	0	0	1		4
7:30 AM	3	0	0	3		0	0	0	0		0	0	0	0		3
7:45 AM	0	0	0	0		0	0	0	0		0	1	0	1		1
Total	3	1	0	4		1	1	0	2		2	1	0	3		9
8:00 AM	0	0	0	0		0	0	0	0		0	0	0	0		0
8:15 AM	0	0	0	0		0	0	0	0		1	0	0	1		1
8:30 AM	2	0	0	2		0	1	0	1		0	1	0	1		4
8:45 AM	0	0	0	0		0	0	0	0		0	0	0	0		0
Total	2	0	0	2		0	1	0	1		1	1	0	2		5
Grand Total	6	1	0	7		1	2	0	3		3	2	0	5		15
Approach %	85.7	14.3	0.0			33.3	66.7	0.0			60.0	40.0	0.0			
Total %	40.0	6.7	0.0	46.7		6.7	13.3	0.0	20.0		20.0	13.3	0.0	33.3		
Exiting Leg Total	3					4					8					15

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Old Bedford Road					Virginia Road					Old Bedford Road					Total
	from North					from East					from South					
	Thru	Left	U-Turn	Total		Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total			
6:45 AM	1	0	0	1		0	0	0	0	0	0	0	0	0	1	
7:00 AM	0	0	0	0		0	0	0	0	1	0	0	1		1	
7:15 AM	0	1	0	1		1	1	0	2	1	0	0	1		4	
7:30 AM	3	0	0	3		0	0	0	0	0	0	0	0		3	
Total Volume	4	1	0	5		1	1	0	2	2	0	0	2		9	
% Approach Total	80.0	20.0	0.0			50.0	50.0	0.0		100.0	0.0	0.0				
PHF	0.333	0.250	0.000	0.417		0.250	0.250	0.000	0.250	0.500	0.000	0.000	0.500		0.563	
Entering Leg	4	1	0	5		1	1	0	2	2	0	0	2		9	
Exiting Leg				1					3				5		9	
Total				6					5				7		18	

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
6:30 AM	0	0	0	0	2	0	0	2	0	0	0	0	2
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	2	0	0	2	0	2	0	2	4
7:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
7:45 AM	2	2	0	4	0	0	0	0	0	2	0	2	6
Total	3	3	0	6	0	0	0	0	0	2	0	2	8
8:00 AM	2	0	0	2	0	1	0	1	1	0	0	1	4
8:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	1	0	0	1	1	0	0	1	2
8:45 AM	2	0	0	2	1	2	0	3	0	0	0	0	5
Total	5	0	0	5	2	3	0	5	2	0	0	2	12
Grand Total	8	3	0	11	4	3	0	7	2	4	0	6	24
Approach %	72.7	27.3	0.0		57.1	42.9	0.0		33.3	66.7	0.0		
Total %	33.3	12.5	0.0	45.8	16.7	12.5	0.0	29.2	8.3	16.7	0.0	25.0	
Exiting Leg Total	8				5				11				24

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
7:45 AM	2	2	0	4	0	0	0	0	0	2	0	2	6
8:00 AM	2	0	0	2	0	1	0	1	1	0	0	1	4
8:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	1	0	0	1	1	0	0	1	2
Total Volume	5	2	0	7	1	1	0	2	2	2	0	4	13
% Approach Total	71.4	28.6	0.0		50.0	50.0	0.0		50.0	50.0	0.0		
PHF	0.625	0.250	0.000	0.438	0.250	0.250	0.000	0.500	0.500	0.250	0.000	0.500	0.542
Entering Leg	5	2	0	7	1	1	0	2	2	2	0	4	13
Exiting Leg				3				4				6	13
Total				10				6				10	26

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	1	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	1	0	1	0	0	0	0	1
Approach %	0.0	0.0	0.0		0.0	100.0	0.0		0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	0				0				1				1

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:15 AM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Volume	0	0	0	0	0	1	0	1	0	0	0	0	1
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.250
Entering Leg	0	0	0	0	0	1	0	1	0	0	0	0	1
Exiting Leg				0				0				1	1
Total				0				1				1	2

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Old Bedford Road						Virginia Road						Old Bedford Road						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
Total	0	0	0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0	2	3
7:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	2
8:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1
Grand Total	0	1	0	0	0	1	2	0	0	0	0	0	2	3	0	0	0	0	3	6
Approach %	0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		
Total %	0.0	16.7	0.0	0.0	0.0	16.7	33.3	0.0	0.0	0.0	0.0	0.0	33.3	50.0	0.0	0.0	0.0	0.0	50.0	
Exiting Leg Total	2						4						0						6	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:15 AM	Old Bedford Road						Virginia Road						Old Bedford Road						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
6:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
7:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	1	0	0	0	1	1	0	0	0	0	1	2	0	0	0	0	0	2	4
% Approach Total	0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0			
PHF	0.000	0.250	0.000	0.000	0.000	0.250	0.250	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.000	0.000	0.000	0.000	0.250	0.500
Entering Leg	0	1	0	0	0	1	1	0	0	0	0	1	2	0	0	0	0	0	2	4
Exiting Leg	1						3						0						4	
Total	2						4						2						8	

PDI File #: 176038 H
 Location: N: Old Bedford Road S: Old Bedford Road
 Location: E: Virginia Road
 City, State: Concord, MA
 Client: Fitzgerald & Halliday/M. Morehouse
 Site Code: TBA
 Count Date: Thursday, April 05, 2018
 Start Time: 6:00 AM
 End Time: 9:00 AM
 Class:



Pedestrians

	Old Bedford Road						Virginia Road						Old Bedford Road						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4	4	4
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	5	5	5
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	40			
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	40	100		
Exiting Leg Total	0						0						5						5	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Old Bedford Road						Virginia Road						Old Bedford Road						Total		
	from North						from East						from South								
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total			
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2	2	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4	4	4	
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0	25.0				
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.250	0.500		0.500	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4	4	4	
Exiting Leg	0						0						4						4		4
Total	0						0						8						8		8

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	21	1	0	22	42	19	0	61	10	57	0	67	150
3:15 PM	43	5	0	48	37	15	0	52	10	59	0	69	169
3:30 PM	32	7	0	39	33	13	0	46	7	66	0	73	158
3:45 PM	32	7	0	39	78	13	0	91	9	74	0	83	213
Total	128	20	0	148	190	60	0	250	36	256	0	292	690
4:00 PM	16	6	0	22	70	24	0	94	13	82	0	95	211
4:15 PM	29	2	0	31	74	27	0	101	6	90	0	96	228
4:30 PM	31	4	0	35	81	10	0	91	9	110	0	119	245
4:45 PM	23	2	0	25	75	21	0	96	10	133	0	143	264
Total	99	14	0	113	300	82	0	382	38	415	0	453	948
5:00 PM	42	8	0	50	69	21	0	90	6	98	0	104	244
5:15 PM	35	3	0	38	59	16	0	75	17	85	0	102	215
5:30 PM	30	4	0	34	59	25	0	84	3	72	0	75	193
5:45 PM	51	0	0	51	45	13	0	58	8	115	0	123	232
Total	158	15	0	173	232	75	0	307	34	370	0	404	884
Grand Total	385	49	0	434	722	217	0	939	108	1041	0	1149	2522
Approach %	88.7	11.3	0.0		76.9	23.1	0.0		9.4	90.6	0.0		
Total %	15.3	1.9	0.0	17.2	28.6	8.6	0.0	37.2	4.3	41.3	0.0	45.6	
Exiting Leg Total				1763				157				602	2522
Cars	374	46	0	420	715	216	0	931	105	1030	0	1135	2486
% Cars	97.1	93.9	0.0	96.8	99.0	99.5	0.0	99.1	97.2	98.9	0.0	98.8	98.6
Exiting Leg Total				1745				151				590	2486
Heavy Vehicles	11	3	0	14	7	1	0	8	3	11	0	14	36
% Heavy Vehicles	2.9	6.1	0.0	3.2	1.0	0.5	0.0	0.9	2.8	1.1	0.0	1.2	1.4
Exiting Leg Total				18				6				12	36

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Old Bedford Road					Virginia Road				Old Bedford Road				Total		
	from North					from East				from South						
	Thru	Left	U-Turn	Total		Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total			
4:15 PM	29	2	0	31		74	27	0	101	6	90	0	96	228		
4:30 PM	31	4	0	35		81	10	0	91	9	110	0	119	245		
4:45 PM	23	2	0	25		75	21	0	96	10	133	0	143	264		
5:00 PM	42	8	0	50		69	21	0	90	6	98	0	104	244		
Total Volume	125	16	0	141		299	79	0	378	31	431	0	462	981		
% Approach Total	88.7	11.3	0.0			79.1	20.9	0.0		6.7	93.3	0.0				
PHF	0.744	0.500	0.000	0.705		0.923	0.731	0.000	0.936	0.775	0.810	0.000	0.808	0.929		
Cars	123	15	0	138		298	79	0	377	30	429	0	459	974		
Cars %	98.4	93.8	0.0	97.9		99.7	100.0	0.0	99.7	96.8	99.5	0.0	99.4	99.3		
Heavy Vehicles	2	1	0	3		1	0	0	1	1	2	0	3	7		
Heavy Vehicles %	1.6	6.3	0.0	2.1		0.3	0.0	0.0	0.3	3.2	0.5	0.0	0.6	0.7		
Cars Enter Leg	123	15	0	138		298	79	0	377	30	429	0	459	974		
Heavy Enter Leg	2	1	0	3		1	0	0	1	1	2	0	3	7		
Total Entering Leg	125	16	0	141		299	79	0	378	31	431	0	462	981		
Cars Exiting Leg					727					45					202	974
Heavy Exiting Leg					3					2					2	7
Total Exiting Leg					730					47					204	981

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	18	1	0	19	40	18	0	58	9	57	0	66	143
3:15 PM	41	5	0	46	37	15	0	52	10	58	0	68	166
3:30 PM	32	7	0	39	33	13	0	46	7	64	0	71	156
3:45 PM	31	7	0	38	77	13	0	90	8	72	0	80	208
Total	122	20	0	142	187	59	0	246	34	251	0	285	673
4:00 PM	15	5	0	20	69	24	0	93	13	81	0	94	207
4:15 PM	28	1	0	29	74	27	0	101	5	89	0	94	224
4:30 PM	31	4	0	35	80	10	0	90	9	110	0	119	244
4:45 PM	23	2	0	25	75	21	0	96	10	132	0	142	263
Total	97	12	0	109	298	82	0	380	37	412	0	449	938
5:00 PM	41	8	0	49	69	21	0	90	6	98	0	104	243
5:15 PM	33	2	0	35	59	16	0	75	17	84	0	101	211
5:30 PM	30	4	0	34	57	25	0	82	3	72	0	75	191
5:45 PM	51	0	0	51	45	13	0	58	8	113	0	121	230
Total	155	14	0	169	230	75	0	305	34	367	0	401	875
Grand Total	374	46	0	420	715	216	0	931	105	1030	0	1135	2486
Approach %	89.0	11.0	0.0		76.8	23.2	0.0		9.3	90.7	0.0		
Total %	15.0	1.9	0.0	16.9	28.8	8.7	0.0	37.4	4.2	41.4	0.0	45.7	
Exiting Leg Total				1745				151				590	2486

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Old Bedford Road					Virginia Road					Old Bedford Road					Total
	from North					from East					from South					
	Thru	Left	U-Turn	Total		Right	Left	U-Turn	Total		Right	Thru	U-Turn	Total		
4:15 PM	28	1	0	29		74	27	0	101		5	89	0	94		224
4:30 PM	31	4	0	35		80	10	0	90		9	110	0	119		244
4:45 PM	23	2	0	25		75	21	0	96		10	132	0	142		263
5:00 PM	41	8	0	49		69	21	0	90		6	98	0	104		243
Total Volume	123	15	0	138		298	79	0	377		30	429	0	459		974
% Approach Total	89.1	10.9	0.0			79.0	21.0	0.0			6.5	93.5	0.0			
PHF	0.750	0.469	0.000	0.704		0.931	0.731	0.000	0.933		0.750	0.813	0.000	0.808		0.926
Entering Leg	123	15	0	138		298	79	0	377		30	429	0	459		974
Exiting Leg				727					45					202		974
Total				865					422					661		1948

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	3	0	0	3	2	1	0	3	1	0	0	1	7
3:15 PM	2	0	0	2	0	0	0	0	0	1	0	1	3
3:30 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
3:45 PM	1	0	0	1	1	0	0	1	1	2	0	3	5
Total	6	0	0	6	3	1	0	4	2	5	0	7	17
4:00 PM	1	1	0	2	1	0	0	1	0	1	0	1	4
4:15 PM	1	1	0	2	0	0	0	0	1	1	0	2	4
4:30 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	2	2	0	4	2	0	0	2	1	3	0	4	10
5:00 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	2	1	0	3	0	0	0	0	0	1	0	1	4
5:30 PM	0	0	0	0	2	0	0	2	0	0	0	0	2
5:45 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
Total	3	1	0	4	2	0	0	2	0	3	0	3	9
Grand Total	11	3	0	14	7	1	0	8	3	11	0	14	36
Approach %	78.6	21.4	0.0		87.5	12.5	0.0		21.4	78.6	0.0		
Total %	30.6	8.3	0.0	38.9	19.4	2.8	0.0	22.2	8.3	30.6	0.0	38.9	
Exiting Leg Total	18				6				12				36
Buses	5	0	0	5	2	1	0	3	2	5	0	7	15
% Buses	45.5	0.0	0.0	35.7	28.6	100.0	0.0	37.5	66.7	45.5	0.0	50.0	41.7
Exiting Leg Total	7				2				6				15
Single-Unit Trucks	4	3	0	7	5	0	0	5	1	4	0	5	17
% Single-Unit	36.4	100.0	0.0	50.0	71.4	0.0	0.0	62.5	33.3	36.4	0.0	35.7	47.2
Exiting Leg Total	9				4				4				17
Articulated Trucks	2	0	0	2	0	0	0	0	0	2	0	2	4
% Articulated	18.2	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	18.2	0.0	14.3	11.1
Exiting Leg Total	2				0				2				4

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	3	0	0	3	2	1	0	3	1	0	0	1	7
3:15 PM	2	0	0	2	0	0	0	0	0	1	0	1	3
3:30 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
3:45 PM	1	0	0	1	1	0	0	1	1	2	0	3	5
Total Volume	6	0	0	6	3	1	0	4	2	5	0	7	17
% Approach Total	100.0	0.0	0.0		75.0	25.0	0.0		28.6	71.4	0.0		
PHF	0.500	0.000	0.000	0.500	0.375	0.250	0.000	0.333	0.500	0.625	0.000	0.583	0.607
Buses	4	0	0	4	1	1	0	2	2	1	0	3	9
Buses %	66.7	0.0	0.0	66.7	33.3	100.0	0.0	50.0	100.0	20.0	0.0	42.9	52.9
Single-Unit Trucks	1	0	0	1	2	0	0	2	0	3	0	3	6
Single-Unit %	16.7	0.0	0.0	16.7	66.7	0.0	0.0	50.0	0.0	60.0	0.0	42.9	35.3
Articulated Trucks	1	0	0	1	0	0	0	0	0	1	0	1	2
Articulated %	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0	20.0	0.0	14.3	11.8
Buses	4	0	0	4	1	1	0	2	2	1	0	3	9
Single-Unit Trucks	1	0	0	1	2	0	0	2	0	3	0	3	6
Articulated Trucks	1	0	0	1	0	0	0	0	0	1	0	1	2
Total Entering Leg	6	0	0	6	3	1	0	4	2	5	0	7	17
Buses				2				2				5	9
Single-Unit Trucks				5				0				1	6
Articulated Trucks				1				0				1	2
Total Exiting Leg				8				2				7	17

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	16	1	0	17	38	14	0	52	8	52	0	60	129
3:15 PM	40	5	0	45	28	14	0	42	8	52	0	60	147
3:30 PM	29	6	0	35	29	10	0	39	6	52	0	58	132
3:45 PM	27	6	0	33	66	10	0	76	8	62	0	70	179
Total	112	18	0	130	161	48	0	209	30	218	0	248	587
4:00 PM	13	5	0	18	61	22	0	83	12	77	0	89	190
4:15 PM	23	1	0	24	73	26	0	99	5	77	0	82	205
4:30 PM	27	4	0	31	70	10	0	80	6	99	0	105	216
4:45 PM	21	2	0	23	66	20	0	86	7	116	0	123	232
Total	84	12	0	96	270	78	0	348	30	369	0	399	843
5:00 PM	37	8	0	45	64	19	0	83	6	94	0	100	228
5:15 PM	32	2	0	34	54	16	0	70	17	80	0	97	201
5:30 PM	27	4	0	31	54	23	0	77	3	69	0	72	180
5:45 PM	49	0	0	49	36	13	0	49	8	105	0	113	211
Total	145	14	0	159	208	71	0	279	34	348	0	382	820
Grand Total	341	44	0	385	639	197	0	836	94	935	0	1029	2250
Approach %	88.6	11.4	0.0		76.4	23.6	0.0		9.1	90.9	0.0		
Total %	15.2	2.0	0.0	17.1	28.4	8.8	0.0	37.2	4.2	41.6	0.0	45.7	
Exiting Leg Total				1574				138				538	2250

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:15 PM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
4:15 PM	23	1	0	24	73	26	0	99	5	77	0	82	205
4:30 PM	27	4	0	31	70	10	0	80	6	99	0	105	216
4:45 PM	21	2	0	23	66	20	0	86	7	116	0	123	232
5:00 PM	37	8	0	45	64	19	0	83	6	94	0	100	228
Total Volume	108	15	0	123	273	75	0	348	24	386	0	410	881
% Approach Total	87.8	12.2	0.0		78.4	21.6	0.0		5.9	94.1	0.0		
PHF	0.730	0.469	0.000	0.683	0.935	0.721	0.000	0.879	0.857	0.832	0.000	0.833	0.949
Entering Leg	108	15	0	123	273	75	0	348	24	386	0	410	881
Exiting Leg				659				39				183	881
Total				782				387				593	1762

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Light Goods Vehicle

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	2	0	0	2	2	4	0	6	1	5	0	6	14
3:15 PM	1	0	0	1	9	1	0	10	2	6	0	8	19
3:30 PM	2	1	0	3	4	3	0	7	1	12	0	13	23
3:45 PM	4	1	0	5	11	3	0	14	0	10	0	10	29
Total	9	2	0	11	26	11	0	37	4	33	0	37	85
4:00 PM	2	0	0	2	8	2	0	10	1	4	0	5	17
4:15 PM	5	0	0	5	1	1	0	2	0	12	0	12	19
4:30 PM	4	0	0	4	10	0	0	10	3	11	0	14	28
4:45 PM	2	0	0	2	9	1	0	10	3	16	0	19	31
Total	13	0	0	13	28	4	0	32	7	43	0	50	95
5:00 PM	4	0	0	4	5	2	0	7	0	4	0	4	15
5:15 PM	1	0	0	1	5	0	0	5	0	4	0	4	10
5:30 PM	3	0	0	3	3	2	0	5	0	3	0	3	11
5:45 PM	2	0	0	2	9	0	0	9	0	8	0	8	19
Total	10	0	0	10	22	4	0	26	0	19	0	19	55
Grand Total	32	2	0	34	76	19	0	95	11	95	0	106	235
Approach %	94.1	5.9	0.0		80.0	20.0	0.0		10.4	89.6	0.0		
Total %	13.6	0.9	0.0	14.5	32.3	8.1	0.0	40.4	4.7	40.4	0.0	45.1	
Exiting Leg Total				171				13				51	235

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:00 PM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
4:00 PM	2	0	0	2	8	2	0	10	1	4	0	5	17
4:15 PM	5	0	0	5	1	1	0	2	0	12	0	12	19
4:30 PM	4	0	0	4	10	0	0	10	3	11	0	14	28
4:45 PM	2	0	0	2	9	1	0	10	3	16	0	19	31
Total Volume	13	0	0	13	28	4	0	32	7	43	0	50	95
% Approach Total	100.0	0.0	0.0		87.5	12.5	0.0		14.0	86.0	0.0		
PHF	0.650	0.000	0.000	0.650	0.700	0.500	0.000	0.800	0.583	0.672	0.000	0.658	0.766
Entering Leg	13	0	0	13	28	4	0	32	7	43	0	50	95
Exiting Leg				71				7				17	95
Total				84				39				67	190

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	3	0	0	3	1	1	0	2	1	0	0	1	6
3:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	1	1	0	2	2
Total	4	0	0	4	1	1	0	2	2	1	0	3	9
4:00 PM	1	0	0	1	1	0	0	1	0	0	0	0	2
4:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	1	0	0	1	1	0	0	1	0	2	0	2	4
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	0	0	0	0	0	0	0	0	2	0	2	2
Grand Total	5	0	0	5	2	1	0	3	2	5	0	7	15
Approach %	100.0	0.0	0.0		66.7	33.3	0.0		28.6	71.4	0.0		
Total %	33.3	0.0	0.0	33.3	13.3	6.7	0.0	20.0	13.3	33.3	0.0	46.7	
Exiting Leg Total	7				2				6				15

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	3	0	0	3	1	1	0	2	1	0	0	1	6
3:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	1	1	0	2	2
Total Volume	4	0	0	4	1	1	0	2	2	1	0	3	9
% Approach Total	100.0	0.0	0.0		50.0	50.0	0.0		66.7	33.3	0.0		
PHF	0.333	0.000	0.000	0.333	0.250	0.250	0.000	0.250	0.500	0.250	0.000	0.375	0.375
Entering Leg	4	0	0	4	1	1	0	2	2	1	0	3	9
Exiting Leg				2				2				5	9
Total				6				4				8	18

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:45 PM	1	0	0	1	1	0	0	1	0	1	0	1	3
Total	1	0	0	1	2	0	0	2	0	3	0	3	6
4:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
4:15 PM	1	1	0	2	0	0	0	0	1	0	0	1	3
4:30 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	2	0	3	1	0	0	1	1	0	0	1	5
5:00 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	1	1	0	2	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	2	0	0	2	0	0	0	0	2
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	2	1	0	3	2	0	0	2	0	1	0	1	6
Grand Total	4	3	0	7	5	0	0	5	1	4	0	5	17
Approach %	57.1	42.9	0.0		100.0	0.0	0.0		20.0	80.0	0.0		
Total %	23.5	17.6	0.0	41.2	29.4	0.0	0.0	29.4	5.9	23.5	0.0	29.4	
Exiting Leg Total	9				4				4				17

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:30 PM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:45 PM	1	0	0	1	1	0	0	1	0	1	0	1	3
4:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
4:15 PM	1	1	0	2	0	0	0	0	1	0	0	1	3
Total Volume	2	2	0	4	1	0	0	1	1	2	0	3	8
% Approach Total	50.0	50.0	0.0		100.0	0.0	0.0		33.3	66.7	0.0		
PHF	0.500	0.500	0.000	0.500	0.250	0.000	0.000	0.250	0.250	0.500	0.000	0.750	0.667
Entering Leg	2	2	0	4	1	0	0	1	1	2	0	3	8
Exiting Leg				3				3				2	8
Total				7				4				5	16

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	1	0	0	0	0	0	1	0	1	2
4:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	1	0	1	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	1	0	0	0	0	0	0	0	0	1
Grand Total	2	0	0	2	0	0	0	0	0	2	0	2	4
Approach %	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
Total %	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	
Exiting Leg Total	2				0				2				4

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:15 PM	Old Bedford Road				Virginia Road				Old Bedford Road				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	1	0	0	1	0	0	0	0	0	2	0	2	3
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.250	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.750
Entering Leg	1	0	0	1	0	0	0	0	0	2	0	2	3
Exiting Leg				2				0				1	3
Total				3				0				3	6

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Old Bedford Road						Virginia Road						Old Bedford Road						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	2
3:30 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	2	0	0	0	2	2	0	0	0	0	0	2	4
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
5:00 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	8	1	0	0	0	9	0	0	0	0	0	0	9	9
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	9	1	0	0	0	10	0	0	0	0	0	0	10	10
Grand Total	0	0	0	0	0	0	9	3	0	0	0	12	2	0	0	1	0	3	15	15
Approach %	0.0	0.0	0.0	0.0	0.0		75.0	25.0	0.0	0.0	0.0		66.7	0.0	0.0	33.3	0.0			
Total %	0.0	0.0	0.0	0.0	0.0	0.0	60.0	20.0	0.0	0.0	0.0	80.0	13.3	0.0	0.0	6.7	0.0	20.0		
Exiting Leg Total	9						2						4						15	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Old Bedford Road						Virginia Road						Old Bedford Road						Total
	from North						from East						from South						
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total	
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	8	1	0	0	0	9	0	0	0	0	0	0	9
Total Volume	0	0	0	0	0	0	9	1	0	0	0	10	0	0	0	0	0	0	10
% Approach Total	0.0	0.0	0.0	0.0	0.0		90.0	10.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.281	0.250	0.000	0.000	0.000	0.278	0.000	0.000	0.000	0.000	0.000	0.000	0.278
Entering Leg	0	0	0	0	0	0	9	1	0	0	0	10	0	0	0	0	0	0	10
Exiting Leg	9						10						1						10
Total	9						10						1						20

PDI File #: **176038 H**
 Location: **N: Old Bedford Road S: Old Bedford Road**
 Location: **E: Virginia Road**
 City, State: **Concord, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	Old Bedford Road						Virginia Road						Old Bedford Road						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	4	4
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	2
Grand Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	4	3	7	8
Approach %	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	57.143	42.857		
Total %	0	0	0	0	0	0	0	0	0	0	12.5	0	12.5	0	0	0	50	37.5	87.5	
Exiting Leg Total	0						1						7						8	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	Old Bedford Road						Virginia Road						Old Bedford Road						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	2
Total Volume	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	2	4	5
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.250	0.500	0.500		0.625
Entering Leg	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	2	4	5
Exiting Leg	0						1						4						5	
Total	0						2						8						10	

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	38	12	0	50	2	1	0	3	4	24	0	28	81
6:15 AM	53	16	0	69	1	5	0	6	5	31	0	36	111
6:30 AM	53	12	0	65	3	3	0	6	9	44	0	53	124
6:45 AM	83	18	0	101	0	4	0	4	19	55	0	74	179
Total	227	58	0	285	6	13	0	19	37	154	0	191	495
7:00 AM	86	16	0	102	5	5	0	10	17	69	0	86	198
7:15 AM	99	19	0	118	8	5	0	13	33	82	0	115	246
7:30 AM	136	26	0	162	9	7	0	16	44	104	0	148	326
7:45 AM	129	19	0	148	6	14	0	20	38	89	0	127	295
Total	450	80	0	530	28	31	0	59	132	344	0	476	1065
8:00 AM	155	19	0	174	6	9	0	15	33	118	0	151	340
8:15 AM	151	25	0	176	4	6	0	10	39	108	0	147	333
8:30 AM	144	35	0	179	7	10	0	17	40	101	0	141	337
8:45 AM	157	22	0	179	4	13	0	17	61	131	0	192	388
Total	607	101	0	708	21	38	0	59	173	458	0	631	1398
Grand Total	1284	239	0	1523	55	82	0	137	342	956	0	1298	2958
Approach %	84.3	15.7	0.0		40.1	59.9	0.0		26.3	73.7	0.0		
Total %	43.4	8.1	0.0	51.5	1.9	2.8	0.0	4.6	11.6	32.3	0.0	43.9	
Exiting Leg Total				1011				581				1366	2958
Cars	1248	235	0	1483	52	79	0	131	335	936	0	1271	2885
% Cars	97.2	98.3	0.0	97.4	94.5	96.3	0.0	95.6	98.0	97.9	0.0	97.9	97.5
Exiting Leg Total				988				570				1327	2885
Heavy Vehicles	36	4	0	40	3	3	0	6	7	20	0	27	73
% Heavy Vehicles	2.8	1.7	0.0	2.6	5.5	3.7	0.0	4.4	2.0	2.1	0.0	2.1	2.5
Exiting Leg Total				23				11				39	73

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
8:00 AM	155	19	0	174	6	9	0	15	33	118	0	151	340
8:15 AM	151	25	0	176	4	6	0	10	39	108	0	147	333
8:30 AM	144	35	0	179	7	10	0	17	40	101	0	141	337
8:45 AM	157	22	0	179	4	13	0	17	61	131	0	192	388
Total Volume	607	101	0	708	21	38	0	59	173	458	0	631	1398
% Approach Total	85.7	14.3	0.0		35.6	64.4	0.0		27.4	72.6	0.0		
PHF	0.967	0.721	0.000	0.989	0.750	0.731	0.000	0.868	0.709	0.874	0.000	0.822	0.901
Cars	589	101	0	690	21	37	0	58	170	448	0	618	1366
Cars %	97.0	100.0	0.0	97.5	100.0	97.4	0.0	98.3	98.3	97.8	0.0	97.9	97.7
Heavy Vehicles	18	0	0	18	0	1	0	1	3	10	0	13	32
Heavy Vehicles %	3.0	0.0	0.0	2.5	0.0	2.6	0.0	1.7	1.7	2.2	0.0	2.1	2.3
Cars Enter Leg	589	101	0	690	21	37	0	58	170	448	0	618	1366
Heavy Enter Leg	18	0	0	18	0	1	0	1	3	10	0	13	32
Total Entering Leg	607	101	0	708	21	38	0	59	173	458	0	631	1398
Cars Exiting Leg				469				271				626	1366
Heavy Exiting Leg				10				3				19	32
Total Exiting Leg				479				274				645	1398

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	38	12	0	50	2	1	0	3	4	24	0	28	81
6:15 AM	53	14	0	67	1	5	0	6	5	28	0	33	106
6:30 AM	52	11	0	63	3	3	0	6	8	42	0	50	119
6:45 AM	81	18	0	99	0	4	0	4	18	55	0	73	176
Total	224	55	0	279	6	13	0	19	35	149	0	184	482
7:00 AM	84	16	0	100	4	4	0	8	17	69	0	86	194
7:15 AM	95	19	0	114	7	5	0	12	32	78	0	110	236
7:30 AM	131	25	0	156	9	7	0	16	44	104	0	148	320
7:45 AM	125	19	0	144	5	13	0	18	37	88	0	125	287
Total	435	79	0	514	25	29	0	54	130	339	0	469	1037
8:00 AM	152	19	0	171	6	9	0	15	32	118	0	150	336
8:15 AM	148	25	0	173	4	6	0	10	38	106	0	144	327
8:30 AM	143	35	0	178	7	10	0	17	40	96	0	136	331
8:45 AM	146	22	0	168	4	12	0	16	60	128	0	188	372
Total	589	101	0	690	21	37	0	58	170	448	0	618	1366
Grand Total	1248	235	0	1483	52	79	0	131	335	936	0	1271	2885
Approach %	84.2	15.8	0.0		39.7	60.3	0.0		26.4	73.6	0.0		
Total %	43.3	8.1	0.0	51.4	1.8	2.7	0.0	4.5	11.6	32.4	0.0	44.1	
Exiting Leg Total				988				570				1327	2885

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
8:00 AM	152	19	0	171	6	9	0	15	32	118	0	150	336
8:15 AM	148	25	0	173	4	6	0	10	38	106	0	144	327
8:30 AM	143	35	0	178	7	10	0	17	40	96	0	136	331
8:45 AM	146	22	0	168	4	12	0	16	60	128	0	188	372
Total Volume	589	101	0	690	21	37	0	58	170	448	0	618	1366
% Approach Total	85.4	14.6	0.0		36.2	63.8	0.0		27.5	72.5	0.0		
PHF	0.969	0.721	0.000	0.969	0.750	0.771	0.000	0.853	0.708	0.875	0.000	0.822	0.918
Entering Leg	589	101	0	690	21	37	0	58	170	448	0	618	1366
Exiting Leg				469				271				626	1366
Total				1159				329				1244	2732

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	2	0	2	0	0	0	0	0	3	0	3	5
6:30 AM	1	1	0	2	0	0	0	0	1	2	0	3	5
6:45 AM	2	0	0	2	0	0	0	0	1	0	0	1	3
Total	3	3	0	6	0	0	0	0	2	5	0	7	13
7:00 AM	2	0	0	2	1	1	0	2	0	0	0	0	4
7:15 AM	4	0	0	4	1	0	0	1	1	4	0	5	10
7:30 AM	5	1	0	6	0	0	0	0	0	0	0	0	6
7:45 AM	4	0	0	4	1	1	0	2	1	1	0	2	8
Total	15	1	0	16	3	2	0	5	2	5	0	7	28
8:00 AM	3	0	0	3	0	0	0	0	1	0	0	1	4
8:15 AM	3	0	0	3	0	0	0	0	1	2	0	3	6
8:30 AM	1	0	0	1	0	0	0	0	0	5	0	5	6
8:45 AM	11	0	0	11	0	1	0	1	1	3	0	4	16
Total	18	0	0	18	0	1	0	1	3	10	0	13	32
Grand Total	36	4	0	40	3	3	0	6	7	20	0	27	73
Approach %	90.0	10.0	0.0		50.0	50.0	0.0		25.9	74.1	0.0		
Total %	49.3	5.5	0.0	54.8	4.1	4.1	0.0	8.2	9.6	27.4	0.0	37.0	
Exiting Leg Total	23				11				39				73
Buses	11	1	0	12	0	3	0	3	0	9	0	9	24
% Buses	30.6	25.0	0.0	30.0	0.0	100.0	0.0	50.0	0.0	45.0	0.0	33.3	32.9
Exiting Leg Total	9				1				14				24
Single-Unit Trucks	23	0	0	23	1	0	0	1	5	11	0	16	40
% Single-Unit	63.9	0.0	0.0	57.5	33.3	0.0	0.0	16.7	71.4	55.0	0.0	59.3	54.8
Exiting Leg Total	12				5				23				40
Articulated Trucks	2	3	0	5	2	0	0	2	2	0	0	2	9
% Articulated	5.6	75.0	0.0	12.5	66.7	0.0	0.0	33.3	28.6	0.0	0.0	7.4	12.3
Exiting Leg Total	2				5				2				9

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
8:00 AM	3	0	0	3	0	0	0	0	1	0	0	1	4
8:15 AM	3	0	0	3	0	0	0	0	1	2	0	3	6
8:30 AM	1	0	0	1	0	0	0	0	0	5	0	5	6
8:45 AM	11	0	0	11	0	1	0	1	1	3	0	4	16
Total Volume	18	0	0	18	0	1	0	1	3	10	0	13	32
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		23.1	76.9	0.0		
PHF	0.409	0.000	0.000	0.409	0.000	0.250	0.000	0.250	0.750	0.500	0.000	0.650	0.500
Buses	9	0	0	9	0	1	0	1	0	6	0	6	16
Buses %	50.0	0.0	0.0	50.0	0.0	100.0	0.0	100.0	0.0	60.0	0.0	46.2	50.0
Single-Unit Trucks	9	0	0	9	0	0	0	0	3	4	0	7	16
Single-Unit %	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	100.0	40.0	0.0	53.8	50.0
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Buses	9	0	0	9	0	1	0	1	0	6	0	6	16
Single-Unit Trucks	9	0	0	9	0	0	0	0	3	4	0	7	16
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Entering Leg	18	0	0	18	0	1	0	1	3	10	0	13	32
Buses	6				0				10				16
Single-Unit Trucks	4				3				9				16
Articulated Trucks	0				0				0				0
Total Exiting Leg	10				3				19				32

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	31	11	0	42	2	1	0	3	4	19	0	23	68
6:15 AM	47	11	0	58	1	4	0	5	5	23	0	28	91
6:30 AM	43	9	0	52	2	3	0	5	7	39	0	46	103
6:45 AM	73	18	0	91	0	3	0	3	16	51	0	67	161
Total	194	49	0	243	5	11	0	16	32	132	0	164	423
7:00 AM	78	15	0	93	4	4	0	8	16	65	0	81	182
7:15 AM	81	17	0	98	6	4	0	10	30	69	0	99	207
7:30 AM	113	24	0	137	7	7	0	14	42	98	0	140	291
7:45 AM	111	19	0	130	3	11	0	14	36	80	0	116	260
Total	383	75	0	458	20	26	0	46	124	312	0	436	940
8:00 AM	142	19	0	161	3	7	0	10	31	108	0	139	310
8:15 AM	134	20	0	154	4	5	0	9	37	98	0	135	298
8:30 AM	127	35	0	162	6	9	0	15	39	89	0	128	305
8:45 AM	140	22	0	162	4	11	0	15	59	126	0	185	362
Total	543	96	0	639	17	32	0	49	166	421	0	587	1275
Grand Total	1120	220	0	1340	42	69	0	111	322	865	0	1187	2638
Approach %	83.6	16.4	0.0		37.8	62.2	0.0		27.1	72.9	0.0		
Total %	42.5	8.3	0.0	50.8	1.6	2.6	0.0	4.2	12.2	32.8	0.0	45.0	
Exiting Leg Total				907				542				1189	2638

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
8:00 AM	142	19	0	161	3	7	0	10	31	108	0	139	310
8:15 AM	134	20	0	154	4	5	0	9	37	98	0	135	298
8:30 AM	127	35	0	162	6	9	0	15	39	89	0	128	305
8:45 AM	140	22	0	162	4	11	0	15	59	126	0	185	362
Total Volume	543	96	0	639	17	32	0	49	166	421	0	587	1275
% Approach Total	85.0	15.0	0.0		34.7	65.3	0.0		28.3	71.7	0.0		
PHF	0.956	0.686	0.000	0.986	0.708	0.727	0.000	0.817	0.703	0.835	0.000	0.793	0.881
Entering Leg	543	96	0	639	17	32	0	49	166	421	0	587	1275
Exiting Leg				438				262				575	1275
Total				1077				311				1162	2550

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Light Goods Vehicle**



	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	7	1	0	8	0	0	0	0	0	5	0	5	13
6:15 AM	6	3	0	9	0	1	0	1	0	5	0	5	15
6:30 AM	9	2	0	11	1	0	0	1	1	3	0	4	16
6:45 AM	8	0	0	8	0	1	0	1	2	4	0	6	15
Total	30	6	0	36	1	2	0	3	3	17	0	20	59
7:00 AM	6	1	0	7	0	0	0	0	1	4	0	5	12
7:15 AM	14	2	0	16	1	1	0	2	2	9	0	11	29
7:30 AM	18	1	0	19	2	0	0	2	2	6	0	8	29
7:45 AM	14	0	0	14	2	2	0	4	1	8	0	9	27
Total	52	4	0	56	5	3	0	8	6	27	0	33	97
8:00 AM	10	0	0	10	3	2	0	5	1	10	0	11	26
8:15 AM	14	5	0	19	0	1	0	1	1	8	0	9	29
8:30 AM	15	0	0	15	1	1	0	2	1	7	0	8	25
8:45 AM	6	0	0	6	0	1	0	1	1	2	0	3	10
Total	45	5	0	50	4	5	0	9	4	27	0	31	90
Grand Total	127	15	0	142	10	10	0	20	13	71	0	84	246
Approach %	89.4	10.6	0.0		50.0	50.0	0.0		15.5	84.5	0.0		
Total %	51.6	6.1	0.0	57.7	4.1	4.1	0.0	8.1	5.3	28.9	0.0	34.1	
Exiting Leg Total				81				28				137	246

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
7:15 AM	14	2	0	16	1	1	0	2	2	9	0	11	29
7:30 AM	18	1	0	19	2	0	0	2	2	6	0	8	29
7:45 AM	14	0	0	14	2	2	0	4	1	8	0	9	27
8:00 AM	10	0	0	10	3	2	0	5	1	10	0	11	26
Total Volume	56	3	0	59	8	5	0	13	6	33	0	39	111
% Approach Total	94.9	5.1	0.0		61.5	38.5	0.0		15.4	84.6	0.0		
PHF	0.778	0.375	0.000	0.776	0.667	0.625	0.000	0.650	0.750	0.825	0.000	0.886	0.957
Entering Leg	56	3	0	59	8	5	0	13	6	33	0	39	111
Exiting Leg				41				9				61	111
Total				100				22				100	222

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	1	0	0	0	0	0	0	0	0	1
7:00 AM	1	0	0	1	0	1	0	1	0	0	0	0	2
7:15 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
7:30 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total	2	0	0	2	0	2	0	2	0	3	0	3	7
8:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	2	0	2	2
8:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
8:45 AM	8	0	0	8	0	1	0	1	0	3	0	3	12
Total	9	0	0	9	0	1	0	1	0	6	0	6	16
Grand Total	11	1	0	12	0	3	0	3	0	9	0	9	24
Approach %	91.7	8.3	0.0		0.0	100.0	0.0		0.0	100.0	0.0		
Total %	45.8	4.2	0.0	50.0	0.0	12.5	0.0	12.5	0.0	37.5	0.0	37.5	
Exiting Leg Total	9				1				14				24

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	Concord Road (Route 62)					Hartwell Road				Concord Road (Route 62)				Total
	from North					from East				from South				
	Thru	Left	U-Turn	Total		Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
8:00 AM	1	0	0	1		0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0		0	0	0	0	0	2	0	2	2
8:30 AM	0	0	0	0		0	0	0	0	0	1	0	1	1
8:45 AM	8	0	0	8		0	1	0	1	0	3	0	3	12
Total Volume	9	0	0	9		0	1	0	1	0	6	0	6	16
% Approach Total	100.0	0.0	0.0			0.0	100.0	0.0		0.0	100.0	0.0		
PHF	0.281	0.000	0.000	0.281		0.000	0.250	0.000	0.250	0.000	0.500	0.000	0.500	0.333
Entering Leg	9	0	0	9		0	1	0	1	0	6	0	6	16
Exiting Leg	6				0				10				16	
Total	15				1				16				32	

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
6:30 AM	1	0	0	1	0	0	0	0	0	2	0	2	3
6:45 AM	2	0	0	2	0	0	0	0	1	0	0	1	3
Total	3	0	0	3	0	0	0	0	1	5	0	6	9
7:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
7:15 AM	3	0	0	3	0	0	0	0	0	1	0	1	4
7:30 AM	4	0	0	4	0	0	0	0	0	0	0	0	4
7:45 AM	3	0	0	3	1	0	0	1	1	1	0	2	6
Total	11	0	0	11	1	0	0	1	1	2	0	3	15
8:00 AM	2	0	0	2	0	0	0	0	1	0	0	1	3
8:15 AM	3	0	0	3	0	0	0	0	1	0	0	1	4
8:30 AM	1	0	0	1	0	0	0	0	0	4	0	4	5
8:45 AM	3	0	0	3	0	0	0	0	1	0	0	1	4
Total	9	0	0	9	0	0	0	0	3	4	0	7	16
Grand Total	23	0	0	23	1	0	0	1	5	11	0	16	40
Approach %	100.0	0.0	0.0		100.0	0.0	0.0		31.3	68.8	0.0		
Total %	57.5	0.0	0.0	57.5	2.5	0.0	0.0	2.5	12.5	27.5	0.0	40.0	
Exiting Leg Total	12				5				23				40

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
7:45 AM	3	0	0	3	1	0	0	1	1	1	0	2	6
8:00 AM	2	0	0	2	0	0	0	0	1	0	0	1	3
8:15 AM	3	0	0	3	0	0	0	0	1	0	0	1	4
8:30 AM	1	0	0	1	0	0	0	0	0	4	0	4	5
Total Volume	9	0	0	9	1	0	0	1	3	5	0	8	18
% Approach Total	100.0	0.0	0.0		100.0	0.0	0.0		37.5	62.5	0.0		
PHF	0.750	0.000	0.000	0.750	0.250	0.000	0.000	0.250	0.750	0.313	0.000	0.500	0.750
Entering Leg	9	0	0	9	1	0	0	1	3	5	0	8	18
Exiting Leg				6				3				9	18
Total				15				4				17	36

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	2	0	2	0	0	0	0	0	0	0	0	2
6:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	2	0	0	0	0	1	0	0	1	3
7:00 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
7:15 AM	1	0	0	1	1	0	0	1	1	0	0	1	3
7:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
7:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total	2	1	0	3	2	0	0	2	1	0	0	1	6
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	2	3	0	5	2	0	0	2	2	0	0	2	9
Approach %	40.0	60.0	0.0		100.0	0.0	0.0		100.0	0.0	0.0		
Total %	22.2	33.3	0.0	55.6	22.2	0.0	0.0	22.2	22.2	0.0	0.0	22.2	
Exiting Leg Total	2				5				2				9

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:00 AM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
7:00 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
7:15 AM	1	0	0	1	1	0	0	1	1	0	0	1	3
7:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
7:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total Volume	2	1	0	3	2	0	0	2	1	0	0	1	6
% Approach Total	66.7	33.3	0.0		100.0	0.0	0.0		100.0	0.0	0.0		
PHF	0.500	0.250	0.000	0.750	0.500	0.000	0.000	0.500	0.250	0.000	0.000	0.250	0.500
Entering Leg	2	1	0	3	2	0	0	2	1	0	0	1	6
Exiting Leg				2				2				2	6
Total				5				4				3	12

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3
Approach %	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0			
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0		
Exiting Leg Total	3						0						0						3	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)								Total
	from North						from East						from South								
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total			
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0				
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250		0.250	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	
Exiting Leg	3						0						0						3		3
Total	3						0						3						3		6

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Pedestrians

	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0		1
Approach %	0	0	0	0	100		0	0	0	0	0		0	0	0	0	0			
Total %	0	0	0	0	100	100	0	0	0	0	0	0	0	0	0	0	0	0		
Exiting Leg Total	1						0						0						1	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)								Total
	from North						from East						from South								
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total			
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6:30 AM	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volume	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
% Approach Total	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				
PHF	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250		
Entering Leg	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Exiting Leg							1													0	1
Total							2													0	2

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	77	5	0	82	25	16	0	41	12	95	0	107	230
3:15 PM	89	9	1	99	8	23	0	31	14	142	0	156	286
3:30 PM	90	5	0	95	36	24	0	60	6	115	0	121	276
3:45 PM	95	4	0	99	17	19	0	36	9	120	0	129	264
Total	351	23	1	375	86	82	0	168	41	472	0	513	1056
4:00 PM	72	9	0	81	12	47	0	59	7	120	0	127	267
4:15 PM	93	3	0	96	23	45	0	68	15	92	0	107	271
4:30 PM	66	5	0	71	21	59	0	80	17	125	0	142	293
4:45 PM	82	8	0	90	25	37	0	62	17	118	0	135	287
Total	313	25	0	338	81	188	0	269	56	455	0	511	1118
5:00 PM	114	5	0	119	33	50	0	83	13	129	0	142	344
5:15 PM	97	11	0	108	21	63	0	84	14	107	0	121	313
5:30 PM	101	8	0	109	19	38	0	57	13	113	0	126	292
5:45 PM	107	10	0	117	21	37	0	58	9	115	0	124	299
Total	419	34	0	453	94	188	0	282	49	464	0	513	1248
Grand Total	1083	82	1	1166	261	458	0	719	146	1391	0	1537	3422
Approach %	92.9	7.0	0.1		36.3	63.7	0.0		9.5	90.5	0.0		
Total %	31.6	2.4	0.0	34.1	7.6	13.4	0.0	21.0	4.3	40.6	0.0	44.9	
Exiting Leg Total	1653				228				1541				3422
Cars	1061	79	1	1141	258	450	0	708	144	1363	0	1507	3356
% Cars	98.0	96.3	100.0	97.9	98.9	98.3	0.0	98.5	98.6	98.0	0.0	98.0	98.1
Exiting Leg Total	1622				223				1511				3356
Heavy Vehicles	22	3	0	25	3	8	0	11	2	28	0	30	66
% Heavy Vehicles	2.0	3.7	0.0	2.1	1.1	1.7	0.0	1.5	1.4	2.0	0.0	2.0	1.9
Exiting Leg Total	31				5				30				66

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

5:00 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
5:00 PM	114	5	0	119	33	50	0	83	13	129	0	142	344
5:15 PM	97	11	0	108	21	63	0	84	14	107	0	121	313
5:30 PM	101	8	0	109	19	38	0	57	13	113	0	126	292
5:45 PM	107	10	0	117	21	37	0	58	9	115	0	124	299
Total Volume	419	34	0	453	94	188	0	282	49	464	0	513	1248
% Approach Total	92.5	7.5	0.0		33.3	66.7	0.0		9.6	90.4	0.0		
PHF	0.919	0.773	0.000	0.952	0.712	0.746	0.000	0.839	0.875	0.899	0.000	0.903	0.907
Cars	414	33	0	447	93	187	0	280	49	459	0	508	1235
Cars %	98.8	97.1	0.0	98.7	98.9	99.5	0.0	99.3	100.0	98.9	0.0	99.0	99.0
Heavy Vehicles	5	1	0	6	1	1	0	2	0	5	0	5	13
Heavy Vehicles %	1.2	2.9	0.0	1.3	1.1	0.5	0.0	0.7	0.0	1.1	0.0	1.0	1.0
Cars Enter Leg	414	33	0	447	93	187	0	280	49	459	0	508	1235
Heavy Enter Leg	5	1	0	6	1	1	0	2	0	5	0	5	13
Total Entering Leg	419	34	0	453	94	188	0	282	49	464	0	513	1248
Cars Exiting Leg				552				82				601	1235
Heavy Exiting Leg				6				1				6	13
Total Exiting Leg				558				83				607	1248

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Cars-Combined (Motorcycles, Cars, Light Goods)**



	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	75	5	0	80	24	15	0	39	12	94	0	106	225
3:15 PM	83	9	1	93	8	22	0	30	14	140	0	154	277
3:30 PM	87	5	0	92	36	23	0	59	5	103	0	108	259
3:45 PM	93	2	0	95	17	19	0	36	8	118	0	126	257
Total	338	21	1	360	85	79	0	164	39	455	0	494	1018
4:00 PM	71	9	0	80	12	45	0	57	7	119	0	126	263
4:15 PM	90	3	0	93	23	44	0	67	15	91	0	106	266
4:30 PM	66	5	0	71	20	59	0	79	17	124	0	141	291
4:45 PM	82	8	0	90	25	36	0	61	17	115	0	132	283
Total	309	25	0	334	80	184	0	264	56	449	0	505	1103
5:00 PM	114	4	0	118	33	50	0	83	13	127	0	140	341
5:15 PM	95	11	0	106	21	62	0	83	14	107	0	121	310
5:30 PM	101	8	0	109	19	38	0	57	13	111	0	124	290
5:45 PM	104	10	0	114	20	37	0	57	9	114	0	123	294
Total	414	33	0	447	93	187	0	280	49	459	0	508	1235
Grand Total	1061	79	1	1141	258	450	0	708	144	1363	0	1507	3356
Approach %	93.0	6.9	0.1		36.4	63.6	0.0		9.6	90.4	0.0		
Total %	31.6	2.4	0.0	34.0	7.7	13.4	0.0	21.1	4.3	40.6	0.0	44.9	
Exiting Leg Total				1622				223				1511	3356

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

5:00 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
5:00 PM	114	4	0	118	33	50	0	83	13	127	0	140	341
5:15 PM	95	11	0	106	21	62	0	83	14	107	0	121	310
5:30 PM	101	8	0	109	19	38	0	57	13	111	0	124	290
5:45 PM	104	10	0	114	20	37	0	57	9	114	0	123	294
Total Volume	414	33	0	447	93	187	0	280	49	459	0	508	1235
% Approach Total	92.6	7.4	0.0		33.2	66.8	0.0		9.6	90.4	0.0		
PHF	0.908	0.750	0.000	0.947	0.705	0.754	0.000	0.843	0.875	0.904	0.000	0.907	0.905
Entering Leg	414	33	0	447	93	187	0	280	49	459	0	508	1235
Exiting Leg				552				82				601	1235
Total				999				362				1109	2470

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	Concord Road (Route 62)					Hartwell Road					Concord Road (Route 62)					Total
	from North					from East					from South					
	Thru	Left	U-Turn		Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total			
3:00 PM	2	0	0		2	1	1	0	2	0	1	0	1	5		
3:15 PM	6	0	0		6	0	1	0	1	0	2	0	2	9		
3:30 PM	3	0	0		3	0	1	0	1	1	12	0	13	17		
3:45 PM	2	2	0		4	0	0	0	0	1	2	0	3	7		
Total	13	2	0		15	1	3	0	4	2	17	0	19	38		
4:00 PM	1	0	0		1	0	2	0	2	0	1	0	1	4		
4:15 PM	3	0	0		3	0	1	0	1	0	1	0	1	5		
4:30 PM	0	0	0		0	1	0	0	1	0	1	0	1	2		
4:45 PM	0	0	0		0	0	1	0	1	0	3	0	3	4		
Total	4	0	0		4	1	4	0	5	0	6	0	6	15		
5:00 PM	0	1	0		1	0	0	0	0	0	2	0	2	3		
5:15 PM	2	0	0		2	0	1	0	1	0	0	0	0	3		
5:30 PM	0	0	0		0	0	0	0	0	0	2	0	2	2		
5:45 PM	3	0	0		3	1	0	0	1	0	1	0	1	5		
Total	5	1	0		6	1	1	0	2	0	5	0	5	13		
Grand Total	22	3	0		25	3	8	0	11	2	28	0	30	66		
Approach %	88.0	12.0	0.0			27.3	72.7	0.0		6.7	93.3	0.0				
Total %	33.3	4.5	0.0		37.9	4.5	12.1	0.0	16.7	3.0	42.4	0.0	45.5			
Exiting Leg Total					31				5				30	66		
Buses	10	1	0		11	0	3	0	3	2	13	0	15	29		
% Buses	45.5	33.3	0.0		44.0	0.0	37.5	0.0	27.3	100.0	46.4	0.0	50.0	43.9		
Exiting Leg Total					13				3				13	29		
Single-Unit Trucks	11	2	0		13	3	3	0	6	0	12	0	12	31		
% Single-Unit	50.0	66.7	0.0		52.0	100.0	37.5	0.0	54.5	0.0	42.9	0.0	40.0	47.0		
Exiting Leg Total					15				2				14	31		
Articulated Trucks	1	0	0		1	0	2	0	2	0	3	0	3	6		
% Articulated	4.5	0.0	0.0		4.0	0.0	25.0	0.0	18.2	0.0	10.7	0.0	10.0	9.1		
Exiting Leg Total					3				0				3	6		

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	2	0	0	2	1	1	0	2	0	1	0	1	5
3:15 PM	6	0	0	6	0	1	0	1	0	2	0	2	9
3:30 PM	3	0	0	3	0	1	0	1	1	12	0	13	17
3:45 PM	2	2	0	4	0	0	0	0	1	2	0	3	7
Total Volume	13	2	0	15	1	3	0	4	2	17	0	19	38
% Approach Total	86.7	13.3	0.0		25.0	75.0	0.0		10.5	89.5	0.0		
PHF	0.542	0.250	0.000	0.625	0.250	0.750	0.000	0.500	0.500	0.354	0.000	0.365	0.559
Buses	9	0	0	9	0	2	0	2	2	10	0	12	23
Buses %	69.2	0.0	0.0	60.0	0.0	66.7	0.0	50.0	100.0	58.8	0.0	63.2	60.5
Single-Unit Trucks	4	2	0	6	1	0	0	1	0	5	0	5	12
Single-Unit %	30.8	100.0	0.0	40.0	100.0	0.0	0.0	25.0	0.0	29.4	0.0	26.3	31.6
Articulated Trucks	0	0	0	0	0	1	0	1	0	2	0	2	3
Articulated %	0.0	0.0	0.0	0.0	0.0	33.3	0.0	25.0	0.0	11.8	0.0	10.5	7.9
Buses	9	0	0	9	0	2	0	2	2	10	0	12	23
Single-Unit Trucks	4	2	0	6	1	0	0	1	0	5	0	5	12
Articulated Trucks	0	0	0	0	0	1	0	1	0	2	0	2	3
Total Entering Leg	13	2	0	15	1	3	0	4	2	17	0	19	38
Buses				10				2				11	23
Single-Unit Trucks				6				2				4	12
Articulated Trucks				2				0				1	3
Total Exiting Leg				18				4				16	38

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	74	5	0	79	20	15	0	35	12	77	0	89	203
3:15 PM	78	9	1	88	6	21	0	27	14	126	0	140	255
3:30 PM	76	5	0	81	34	22	0	56	5	86	0	91	228
3:45 PM	76	2	0	78	14	18	0	32	8	104	0	112	222
Total	304	21	1	326	74	76	0	150	39	393	0	432	908
4:00 PM	67	9	0	76	12	44	0	56	6	109	0	115	247
4:15 PM	83	3	0	86	21	43	0	64	13	82	0	95	245
4:30 PM	62	3	0	65	20	51	0	71	17	106	0	123	259
4:45 PM	75	7	0	82	23	32	0	55	15	100	0	115	252
Total	287	22	0	309	76	170	0	246	51	397	0	448	1003
5:00 PM	109	4	0	113	33	41	0	74	13	118	0	131	318
5:15 PM	86	11	0	97	19	59	0	78	14	102	0	116	291
5:30 PM	97	7	0	104	18	37	0	55	11	103	0	114	273
5:45 PM	104	10	0	114	18	34	0	52	8	103	0	111	277
Total	396	32	0	428	88	171	0	259	46	426	0	472	1159
Grand Total	987	75	1	1063	238	417	0	655	136	1216	0	1352	3070
Approach %	92.9	7.1	0.1		36.3	63.7	0.0		10.1	89.9	0.0		
Total %	32.1	2.4	0.0	34.6	7.8	13.6	0.0	21.3	4.4	39.6	0.0	44.0	
Exiting Leg Total				1455				211				1404	3070

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

5:00 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
5:00 PM	109	4	0	113	33	41	0	74	13	118	0	131	318
5:15 PM	86	11	0	97	19	59	0	78	14	102	0	116	291
5:30 PM	97	7	0	104	18	37	0	55	11	103	0	114	273
5:45 PM	104	10	0	114	18	34	0	52	8	103	0	111	277
Total Volume	396	32	0	428	88	171	0	259	46	426	0	472	1159
% Approach Total	92.5	7.5	0.0		34.0	66.0	0.0		9.7	90.3	0.0		
PHF	0.908	0.727	0.000	0.939	0.667	0.725	0.000	0.830	0.821	0.903	0.000	0.901	0.911
Entering Leg	396	32	0	428	88	171	0	259	46	426	0	472	1159
Exiting Leg				514				78				567	1159
Total				942				337				1039	2318

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class: **Light Goods Vehicle**



	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	1	0	0	1	4	0	0	4	0	17	0	17	22
3:15 PM	5	0	0	5	2	1	0	3	0	14	0	14	22
3:30 PM	11	0	0	11	2	1	0	3	0	17	0	17	31
3:45 PM	17	0	0	17	3	1	0	4	0	14	0	14	35
Total	34	0	0	34	11	3	0	14	0	62	0	62	110
4:00 PM	4	0	0	4	0	1	0	1	1	10	0	11	16
4:15 PM	6	0	0	6	2	1	0	3	2	9	0	11	20
4:30 PM	4	2	0	6	0	8	0	8	0	18	0	18	32
4:45 PM	6	1	0	7	2	4	0	6	2	15	0	17	30
Total	20	3	0	23	4	14	0	18	5	52	0	57	98
5:00 PM	5	0	0	5	0	9	0	9	0	9	0	9	23
5:15 PM	9	0	0	9	2	3	0	5	0	5	0	5	19
5:30 PM	4	1	0	5	1	1	0	2	2	7	0	9	16
5:45 PM	0	0	0	0	2	3	0	5	1	11	0	12	17
Total	18	1	0	19	5	16	0	21	3	32	0	35	75
Grand Total	72	4	0	76	20	33	0	53	8	146	0	154	283
Approach %	94.7	5.3	0.0		37.7	62.3	0.0		5.2	94.8	0.0		
Total %	25.4	1.4	0.0	26.9	7.1	11.7	0.0	18.7	2.8	51.6	0.0	54.4	
Exiting Leg Total	166				12				105				283

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	1	0	0	1	4	0	0	4	0	17	0	17	22
3:15 PM	5	0	0	5	2	1	0	3	0	14	0	14	22
3:30 PM	11	0	0	11	2	1	0	3	0	17	0	17	31
3:45 PM	17	0	0	17	3	1	0	4	0	14	0	14	35
Total Volume	34	0	0	34	11	3	0	14	0	62	0	62	110
% Approach Total	100.0	0.0	0.0		78.6	21.4	0.0		0.0	100.0	0.0		
PHF	0.500	0.000	0.000	0.500	0.688	0.750	0.000	0.875	0.000	0.912	0.000	0.912	0.786
Entering Leg	34	0	0	34	11	3	0	14	0	62	0	62	110
Exiting Leg				73				0				37	110
Total				107				14				99	220

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	2	0	0	2	0	0	0	0	0	0	0	0	2
3:15 PM	6	0	0	6	0	1	0	1	0	0	0	0	7
3:30 PM	1	0	0	1	0	1	0	1	1	10	0	11	13
3:45 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	9	0	0	9	0	2	0	2	2	10	0	12	23
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total	1	0	0	1	0	1	0	1	0	0	0	0	2
5:00 PM	0	1	0	1	0	0	0	0	0	2	0	2	3
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	1	0	0	0	0	0	3	0	3	4
Grand Total	10	1	0	11	0	3	0	3	2	13	0	15	29
Approach %	90.9	9.1	0.0		0.0	100.0	0.0		13.3	86.7	0.0		
Total %	34.5	3.4	0.0	37.9	0.0	10.3	0.0	10.3	6.9	44.8	0.0	51.7	
Exiting Leg Total	13				3				13				29

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	2	0	0	2	0	0	0	0	0	0	0	0	2
3:15 PM	6	0	0	6	0	1	0	1	0	0	0	0	7
3:30 PM	1	0	0	1	0	1	0	1	1	10	0	11	13
3:45 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Volume	9	0	0	9	0	2	0	2	2	10	0	12	23
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		16.7	83.3	0.0		
PHF	0.375	0.000	0.000	0.375	0.000	0.500	0.000	0.500	0.500	0.250	0.000	0.273	0.442
Entering Leg	9	0	0	9	0	2	0	2	2	10	0	12	23
Exiting Leg	10				2				11				23
Total	19				4				23				46

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
3:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:30 PM	2	0	0	2	0	0	0	0	0	2	0	2	4
3:45 PM	2	2	0	4	0	0	0	0	0	1	0	1	5
Total	4	2	0	6	1	0	0	1	0	5	0	5	12
4:00 PM	1	0	0	1	0	1	0	1	0	1	0	1	3
4:15 PM	2	0	0	2	0	1	0	1	0	0	0	0	3
4:30 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
4:45 PM	0	0	0	0	0	0	0	0	0	3	0	3	3
Total	3	0	0	3	1	2	0	3	0	5	0	5	11
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	1	0	0	1	0	1	0	1	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
5:45 PM	3	0	0	3	1	0	0	1	0	1	0	1	5
Total	4	0	0	4	1	1	0	2	0	2	0	2	8
Grand Total	11	2	0	13	3	3	0	6	0	12	0	12	31
Approach %	84.6	15.4	0.0		50.0	50.0	0.0		0.0	100.0	0.0		
Total %	35.5	6.5	0.0	41.9	9.7	9.7	0.0	19.4	0.0	38.7	0.0	38.7	
Exiting Leg Total	15				2				14				31

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:30 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:30 PM	2	0	0	2	0	0	0	0	0	2	0	2	4
3:45 PM	2	2	0	4	0	0	0	0	0	1	0	1	5
4:00 PM	1	0	0	1	0	1	0	1	0	1	0	1	3
4:15 PM	2	0	0	2	0	1	0	1	0	0	0	0	3
Total Volume	7	2	0	9	0	2	0	2	0	4	0	4	15
% Approach Total	77.8	22.2	0.0		0.0	100.0	0.0		0.0	100.0	0.0		
PHF	0.875	0.250	0.000	0.563	0.000	0.500	0.000	0.500	0.000	0.500	0.000	0.500	0.750
Entering Leg	7	2	0	9	0	2	0	2	0	4	0	4	15
Exiting Leg	4				2				9				15
Total	13				4				13				30

PDI File #: **176038 I**
 Location: **N: Concord Road (Route 62) S: Concord Road (Route 62)**
 Location: **E: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	0	0	0	0	1	0	1	0	2	0	2	3
4:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	1	0	1	0	1	2
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	1	0	0	0	0	0	0	0	0	1
Grand Total	1	0	0	1	0	2	0	2	0	3	0	3	6
Approach %	100.0	0.0	0.0		0.0	100.0	0.0		0.0	100.0	0.0		
Total %	16.7	0.0	0.0	16.7	0.0	33.3	0.0	33.3	0.0	50.0	0.0	50.0	
Exiting Leg Total	3				0				3				6

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Concord Road (Route 62)				Hartwell Road				Concord Road (Route 62)				Total
	from North				from East				from South				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	
3:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	1	0	1	0	2	0	2	3
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		0.0	100.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.500	0.000	0.500	0.750
Entering Leg	0	0	0	0	0	1	0	1	0	2	0	2	3
Exiting Leg				2				0				1	3
Total				2				1				3	6

PDI File #: 176038 I
 Location: N: Concord Road (Route 62) S: Concord Road (Route 62)
 Location: E: Hartwell Road
 City, State: Bedford, MA
 Client: Fitzgerald & Halliday/M. Morehouse
 Site Code: TBA
 Count Date: Thursday, April 05, 2018
 Start Time: 3:00 PM
 End Time: 6:00 PM
 Class:



Bicycles (on Roadway and Crosswalks)

	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)						Total
	from North						from East						from South						
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
5:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	2
Grand Total	1	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	3	4
Approach %	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		
Total %	25.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	75.0	
Exiting Leg Total	3						0						1						4

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:45 PM	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)								Total
	from North						from East						from South								
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total			
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	
5:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	2	
Total Volume	1	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	2	3	
% Approach Total	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0				
PHF	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.500	0.375		
Entering Leg	1	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	2	3	
Exiting Leg	2						0						1						3		
Total	3						0						3						6		

PDI File #: 176038 I
 Location: N: Concord Road (Route 62) S: Concord Road (Route 62)
 Location: E: Hartwell Road
 City, State: Bedford, MA
 Client: Fitzgerald & Halliday/M. Morehouse
 Site Code: TBA
 Count Date: Thursday, April 05, 2018
 Start Time: 3:00 PM
 End Time: 6:00 PM
 Class:



Pedestrians

	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)						Total	
	from North						from East						from South							
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0	

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	Concord Road (Route 62)						Hartwell Road						Concord Road (Route 62)								Total
	from North						from East						from South								
	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	U-Turn	CW-WB	CW-EB	Total			
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Exiting Leg	0						0						0						0		
Total	0						0						0						0		

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars and Heavy Vehicles (Combined)

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:00 AM	3	45	0	48	9	12	0	21	5	2	0	7	76
6:15 AM	7	86	0	93	14	12	0	26	8	1	0	9	128
6:30 AM	8	108	0	116	12	14	0	26	3	6	0	9	151
6:45 AM	11	136	0	147	28	5	0	33	12	14	0	26	206
Total	29	375	0	404	63	43	0	106	28	23	0	51	561
7:00 AM	16	138	0	154	47	14	0	61	10	9	0	19	234
7:15 AM	17	122	0	139	60	15	0	75	13	19	0	32	246
7:30 AM	19	154	0	173	45	13	0	58	39	16	0	55	286
7:45 AM	14	140	1	155	33	16	0	49	26	13	0	39	243
Total	66	554	1	621	185	58	0	243	88	57	0	145	1009
8:00 AM	12	153	0	165	35	15	0	50	25	22	0	47	262
8:15 AM	16	129	0	145	26	14	0	40	21	12	0	33	218
8:30 AM	12	127	0	139	28	21	0	49	31	14	0	45	233
8:45 AM	18	104	0	122	36	23	0	59	27	33	0	60	241
Total	58	513	0	571	125	73	0	198	104	81	0	185	954
Grand Total	153	1442	1	1596	373	174	0	547	220	161	0	381	2524
Approach %	9.6	90.4	0.1		68.2	31.8	0.0		57.7	42.3	0.0		
Total %	6.1	57.1	0.0	63.2	14.8	6.9	0.0	21.7	8.7	6.4	0.0	15.1	
Exiting Leg Total				535				1662				327	2524
Cars	150	1421	1	1572	353	169	0	522	214	155	0	369	2463
% Cars	98.0	98.5	100.0	98.5	94.6	97.1	0.0	95.4	97.3	96.3	0.0	96.9	97.6
Exiting Leg Total				509				1635				319	2463
Heavy Vehicles	3	21	0	24	20	5	0	25	6	6	0	12	61
% Heavy Vehicles	2.0	1.5	0.0	1.5	5.4	2.9	0.0	4.6	2.7	3.7	0.0	3.1	2.4
Exiting Leg Total				26				27				8	61

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
7:15 AM	17	122	0	139	60	15	0	75	13	19	0	32	246
7:30 AM	19	154	0	173	45	13	0	58	39	16	0	55	286
7:45 AM	14	140	1	155	33	16	0	49	26	13	0	39	243
8:00 AM	12	153	0	165	35	15	0	50	25	22	0	47	262
Total Volume	62	569	1	632	173	59	0	232	103	70	0	173	1037
% Approach Total	9.8	90.0	0.2		74.6	25.4	0.0		59.5	40.5	0.0		
PHF	0.816	0.924	0.250	0.913	0.721	0.922	0.000	0.773	0.660	0.795	0.000	0.786	0.906
Cars	61	563	1	625	162	57	0	219	100	69	0	169	1013
Cars %	98.4	98.9	100.0	98.9	93.6	96.6	0.0	94.4	97.1	98.6	0.0	97.7	97.7
Heavy Vehicles	1	6	0	7	11	2	0	13	3	1	0	4	24
Heavy Vehicles %	1.6	1.1	0.0	1.1	6.4	3.4	0.0	5.6	2.9	1.4	0.0	2.3	2.3
Cars Enter Leg	61	563	1	625	162	57	0	219	100	69	0	169	1013
Heavy Enter Leg	1	6	0	7	11	2	0	13	3	1	0	4	24
Total Entering Leg	62	569	1	632	173	59	0	232	103	70	0	173	1037
Cars Exiting Leg				232				663				118	1013
Heavy Exiting Leg				12				9				3	24
Total Exiting Leg				244				672				121	1037

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:00 AM	3	43	0	46	9	12	0	21	5	2	0	7	74
6:15 AM	6	86	0	92	14	12	0	26	8	1	0	9	127
6:30 AM	8	107	0	115	12	14	0	26	3	6	0	9	150
6:45 AM	11	130	0	141	27	5	0	32	11	13	0	24	197
Total	28	366	0	394	62	43	0	105	27	22	0	49	548
7:00 AM	15	136	0	151	45	14	0	59	9	9	0	18	228
7:15 AM	17	118	0	135	52	14	0	66	13	19	0	32	233
7:30 AM	18	154	0	172	45	13	0	58	39	16	0	55	285
7:45 AM	14	139	1	154	32	16	0	48	24	13	0	37	239
Total	64	547	1	612	174	57	0	231	85	57	0	142	985
8:00 AM	12	152	0	164	33	14	0	47	24	21	0	45	256
8:15 AM	16	128	0	144	25	14	0	39	21	11	0	32	215
8:30 AM	12	124	0	136	26	20	0	46	30	13	0	43	225
8:45 AM	18	104	0	122	33	21	0	54	27	31	0	58	234
Total	58	508	0	566	117	69	0	186	102	76	0	178	930
Grand Total	150	1421	1	1572	353	169	0	522	214	155	0	369	2463
Approach %	9.5	90.4	0.1		67.6	32.4	0.0		58.0	42.0	0.0		
Total %	6.1	57.7	0.0	63.8	14.3	6.9	0.0	21.2	8.7	6.3	0.0	15.0	
Exiting Leg Total				509				1635				319	2463

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
7:15 AM	17	118	0	135	52	14	0	66	13	19	0	32	233
7:30 AM	18	154	0	172	45	13	0	58	39	16	0	55	285
7:45 AM	14	139	1	154	32	16	0	48	24	13	0	37	239
8:00 AM	12	152	0	164	33	14	0	47	24	21	0	45	256
Total Volume	61	563	1	625	162	57	0	219	100	69	0	169	1013
% Approach Total	9.8	90.1	0.2		74.0	26.0	0.0		59.2	40.8	0.0		
PHF	0.847	0.914	0.250	0.908	0.779	0.891	0.000	0.830	0.641	0.821	0.000	0.768	0.889
Entering Leg	61	563	1	625	162	57	0	219	100	69	0	169	1013
Exiting Leg				232				663				118	1013
Total				857				882				287	2026

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	South Road				South Road				Hartwell Road				Total	
	from North				from South				from West					
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total		
6:00 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	2
6:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	0	1
6:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	6	0	6	1	0	0	1	1	1	1	0	2	9
Total	1	9	0	10	1	0	0	1	1	1	1	0	2	13
7:00 AM	1	2	0	3	2	0	0	2	1	0	0	1	1	6
7:15 AM	0	4	0	4	8	1	0	9	0	0	0	0	0	13
7:30 AM	1	0	0	1	0	0	0	0	0	0	0	0	0	1
7:45 AM	0	1	0	1	1	0	0	1	2	0	0	0	2	4
Total	2	7	0	9	11	1	0	12	3	0	0	3	3	24
8:00 AM	0	1	0	1	2	1	0	3	1	1	0	2	1	6
8:15 AM	0	1	0	1	1	0	0	1	0	1	0	1	1	3
8:30 AM	0	3	0	3	2	1	0	3	1	1	0	2	2	8
8:45 AM	0	0	0	0	3	2	0	5	0	2	0	2	2	7
Total	0	5	0	5	8	4	0	12	2	5	0	7	7	24
Grand Total	3	21	0	24	20	5	0	25	6	6	0	12	12	61
Approach %	12.5	87.5	0.0		80.0	20.0	0.0		50.0	50.0	0.0			
Total %	4.9	34.4	0.0	39.3	32.8	8.2	0.0	41.0	9.8	9.8	0.0	19.7	19.7	
Exiting Leg Total	26				27				8				61	
Buses	2	13	0	15	13	1	0	14	1	1	0	2	2	31
% Buses	66.7	61.9	0.0	62.5	65.0	20.0	0.0	56.0	16.7	16.7	0.0	16.7	16.7	50.8
Exiting Leg Total	14				14				3				31	
Single-Unit Trucks	0	8	0	8	6	3	0	9	3	4	0	7	7	24
% Single-Unit	0.0	38.1	0.0	33.3	30.0	60.0	0.0	36.0	50.0	66.7	0.0	58.3	58.3	39.3
Exiting Leg Total	10				11				3				24	
Articulated Trucks	1	0	0	1	1	1	0	2	2	1	0	3	3	6
% Articulated	33.3	0.0	0.0	4.2	5.0	20.0	0.0	8.0	33.3	16.7	0.0	25.0	25.0	9.8
Exiting Leg Total	2				2				2				6	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	South Road				South Road				Hartwell Road				Total	
	from North				from South				from West					
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total		
6:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	6	0	6	1	0	0	1	1	1	0	2	9	
7:00 AM	1	2	0	3	2	0	0	2	1	0	0	1	6	
7:15 AM	0	4	0	4	8	1	0	9	0	0	0	0	13	
Total Volume	1	13	0	14	11	1	0	12	2	1	0	3	29	
% Approach Total	7.1	92.9	0.0		91.7	8.3	0.0		66.7	33.3	0.0			
PHF	0.250	0.542	0.000	0.583	0.344	0.250	0.000	0.333	0.500	0.250	0.000	0.375	0.558	
Buses	1	10	0	11	7	0	0	7	0	1	0	1	19	
Buses %	100.0	76.9	0.0	78.6	63.6	0.0	0.0	58.3	0.0	100.0	0.0	33.3	65.5	
Single-Unit Trucks	0	3	0	3	4	1	0	5	1	0	0	1	9	
Single-Unit %	0.0	23.1	0.0	21.4	36.4	100.0	0.0	41.7	50.0	0.0	0.0	33.3	31.0	
Articulated Trucks	0	0	0	0	0	0	0	0	1	0	0	1	1	
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	33.3	3.4	
Buses	1	10	0	11	7	0	0	7	0	1	0	1	19	
Single-Unit Trucks	0	3	0	3	4	1	0	5	1	0	0	1	9	
Articulated Trucks	0	0	0	0	0	0	0	0	1	0	0	1	1	
Total Entering Leg	1	13	0	14	11	1	0	12	2	1	0	3	29	
Buses	8				10				1				19	
Single-Unit Trucks	4				4				1				9	
Articulated Trucks	0				1				0				1	
Total Exiting Leg	12				15				2				29	

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Cars

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:00 AM	3	36	0	39	8	9	0	17	3	2	0	5	61
6:15 AM	5	68	0	73	12	10	0	22	7	1	0	8	103
6:30 AM	8	91	0	99	10	12	0	22	3	4	0	7	128
6:45 AM	11	110	0	121	22	5	0	27	10	12	0	22	170
Total	27	305	0	332	52	36	0	88	23	19	0	42	462
7:00 AM	14	127	0	141	39	13	0	52	8	8	0	16	209
7:15 AM	13	106	0	119	46	12	0	58	13	18	0	31	208
7:30 AM	18	136	0	154	40	13	0	53	33	14	0	47	254
7:45 AM	11	133	1	145	30	14	0	44	22	12	0	34	223
Total	56	502	1	559	155	52	0	207	76	52	0	128	894
8:00 AM	10	136	0	146	30	12	0	42	22	21	0	43	231
8:15 AM	14	115	0	129	22	13	0	35	20	7	0	27	191
8:30 AM	8	112	0	120	24	19	0	43	29	13	0	42	205
8:45 AM	14	92	0	106	26	19	0	45	26	29	0	55	206
Total	46	455	0	501	102	63	0	165	97	70	0	167	833
Grand Total	129	1262	1	1392	309	151	0	460	196	141	0	337	2189
Approach %	9.3	90.7	0.1		67.2	32.8	0.0		58.2	41.8	0.0		
Total %	5.9	57.7	0.0	63.6	14.1	6.9	0.0	21.0	9.0	6.4	0.0	15.4	
Exiting Leg Total				451				1458				280	2189

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:15 AM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
7:15 AM	13	106	0	119	46	12	0	58	13	18	0	31	208
7:30 AM	18	136	0	154	40	13	0	53	33	14	0	47	254
7:45 AM	11	133	1	145	30	14	0	44	22	12	0	34	223
8:00 AM	10	136	0	146	30	12	0	42	22	21	0	43	231
Total Volume	52	511	1	564	146	51	0	197	90	65	0	155	916
% Approach Total	9.2	90.6	0.2		74.1	25.9	0.0		58.1	41.9	0.0		
PHF	0.722	0.939	0.250	0.916	0.793	0.911	0.000	0.849	0.682	0.774	0.000	0.824	0.902
Entering Leg	52	511	1	564	146	51	0	197	90	65	0	155	916
Exiting Leg				212				601				103	916
Total				776				798				258	1832

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Light Goods Vehicle

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:00 AM	0	7	0	7	1	3	0	4	2	0	0	2	13
6:15 AM	1	18	0	19	2	2	0	4	1	0	0	1	24
6:30 AM	0	16	0	16	2	2	0	4	0	2	0	2	22
6:45 AM	0	20	0	20	5	0	0	5	1	1	0	2	27
Total	1	61	0	62	10	7	0	17	4	3	0	7	86
7:00 AM	1	9	0	10	6	1	0	7	1	1	0	2	19
7:15 AM	4	12	0	16	6	2	0	8	0	1	0	1	25
7:30 AM	0	18	0	18	5	0	0	5	6	2	0	8	31
7:45 AM	3	6	0	9	2	2	0	4	2	1	0	3	16
Total	8	45	0	53	19	5	0	24	9	5	0	14	91
8:00 AM	2	16	0	18	3	2	0	5	2	0	0	2	25
8:15 AM	2	13	0	15	3	1	0	4	1	4	0	5	24
8:30 AM	4	12	0	16	2	1	0	3	1	0	0	1	20
8:45 AM	4	12	0	16	7	2	0	9	1	2	0	3	28
Total	12	53	0	65	15	6	0	21	5	6	0	11	97
Grand Total	21	159	0	180	44	18	0	62	18	14	0	32	274
Approach %	11.7	88.3	0.0		71.0	29.0	0.0		56.3	43.8	0.0		
Total %	7.7	58.0	0.0	65.7	16.1	6.6	0.0	22.6	6.6	5.1	0.0	11.7	
Exiting Leg Total				58				177				39	274

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:45 AM	0	20	0	20	5	0	0	5	1	1	0	2	27
7:00 AM	1	9	0	10	6	1	0	7	1	1	0	2	19
7:15 AM	4	12	0	16	6	2	0	8	0	1	0	1	25
7:30 AM	0	18	0	18	5	0	0	5	6	2	0	8	31
Total Volume	5	59	0	64	22	3	0	25	8	5	0	13	102
% Approach Total	7.8	92.2	0.0		88.0	12.0	0.0		61.5	38.5	0.0		
PHF	0.313	0.738	0.000	0.800	0.917	0.375	0.000	0.781	0.333	0.625	0.000	0.406	0.823
Entering Leg	5	59	0	64	22	3	0	25	8	5	0	13	102
Exiting Leg				27				67				8	102
Total				91				92				21	204

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Buses

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
6:45 AM	0	5	0	5	1	0	0	1	0	1	0	1	7
Total	0	6	0	6	1	0	0	1	0	1	0	1	8
7:00 AM	1	1	0	2	0	0	0	0	0	0	0	0	2
7:15 AM	0	3	0	3	6	0	0	6	0	0	0	0	9
7:30 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
7:45 AM	0	1	0	1	1	0	0	1	0	0	0	0	2
Total	2	5	0	7	7	0	0	7	0	0	0	0	14
8:00 AM	0	0	0	0	1	0	0	1	1	0	0	1	2
8:15 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
8:30 AM	0	2	0	2	2	0	0	2	0	0	0	0	4
8:45 AM	0	0	0	0	1	1	0	2	0	0	0	0	2
Total	0	2	0	2	5	1	0	6	1	0	0	1	9
Grand Total	2	13	0	15	13	1	0	14	1	1	0	2	31
Approach %	13.3	86.7	0.0		92.9	7.1	0.0		50.0	50.0	0.0		
Total %	6.5	41.9	0.0	48.4	41.9	3.2	0.0	45.2	3.2	3.2	0.0	6.5	
Exiting Leg Total	14				14				3				31

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:30 AM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:30 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
6:45 AM	0	5	0	5	1	0	0	1	0	1	0	1	7
7:00 AM	1	1	0	2	0	0	0	0	0	0	0	0	2
7:15 AM	0	3	0	3	6	0	0	6	0	0	0	0	9
Total Volume	1	10	0	11	7	0	0	7	0	1	0	1	19
% Approach Total	9.1	90.9	0.0		100.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.250	0.500	0.000	0.550	0.292	0.000	0.000	0.292	0.000	0.250	0.000	0.250	0.528
Entering Leg	1	10	0	11	7	0	0	7	0	1	0	1	19
Exiting Leg				8				10				1	19
Total				19				17				2	38

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Single-Unit Trucks

	South Road				South Road				Hartwell Road				Total	
	from North				from South				from West					
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total		
6:00 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	2
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	1
Total	0	3	0	3	0	0	0	0	0	0	0	0	0	3
7:00 AM	0	1	0	1	2	0	0	2	1	0	0	1	4	
7:15 AM	0	1	0	1	2	1	0	3	0	0	0	0	4	
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	
7:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1	
Total	0	2	0	2	4	1	0	5	2	0	0	2	9	
8:00 AM	0	1	0	1	0	1	0	1	0	0	0	0	2	
8:15 AM	0	1	0	1	0	0	0	0	0	1	0	1	2	
8:30 AM	0	1	0	1	0	0	0	0	1	1	0	2	3	
8:45 AM	0	0	0	0	2	1	0	3	0	2	0	2	5	
Total	0	3	0	3	2	2	0	4	1	4	0	5	12	
Grand Total	0	8	0	8	6	3	0	9	3	4	0	7	24	
Approach %	0.0	100.0	0.0		66.7	33.3	0.0		42.9	57.1	0.0			
Total %	0.0	33.3	0.0	33.3	25.0	12.5	0.0	37.5	12.5	16.7	0.0	29.2		
Exiting Leg Total	10				11				3				24	

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

8:00 AM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
8:00 AM	0	1	0	1	0	1	0	1	0	0	0	0	2
8:15 AM	0	1	0	1	0	0	0	0	0	1	0	1	2
8:30 AM	0	1	0	1	0	0	0	0	1	1	0	2	3
8:45 AM	0	0	0	0	2	1	0	3	0	2	0	2	5
Total Volume	0	3	0	3	2	2	0	4	1	4	0	5	12
% Approach Total	0.0	100.0	0.0		50.0	50.0	0.0		20.0	80.0	0.0		
PHF	0.000	0.750	0.000	0.750	0.250	0.500	0.000	0.333	0.250	0.500	0.000	0.625	0.600
Entering Leg	0	3	0	3	2	2	0	4	1	4	0	5	12
Exiting Leg				6				4				2	12
Total				9				8				7	24

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Articulated Trucks

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	1	0	0	1	0	0	0	0	1	0	0	1	2
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	0	0	0	1	0	0	1	1
8:00 AM	0	0	0	0	1	0	0	1	0	1	0	1	2
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	1	0	2	0	1	0	1	3
Grand Total	1	0	0	1	1	1	0	2	2	1	0	3	6
Approach %	100.0	0.0	0.0		50.0	50.0	0.0		66.7	33.3	0.0		
Total %	16.7	0.0	0.0	16.7	16.7	16.7	0.0	33.3	33.3	16.7	0.0	50.0	
Exiting Leg Total	2				2				2				6

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

7:45 AM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
7:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	1
8:00 AM	0	0	0	0	1	0	0	1	0	1	0	1	2
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Volume	0	0	0	0	1	1	0	2	1	1	0	2	4
% Approach Total	0.0	0.0	0.0		50.0	50.0	0.0		50.0	50.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.500	0.250	0.250	0.000	0.500	0.500
Entering Leg	0	0	0	0	1	1	0	2	1	1	0	2	4
Exiting Leg	2				1				1				4
Total	2				3				3				8

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **6:00 AM**
 End Time: **9:00 AM**
 Class:



Bicycles (on Roadway and Crosswalks)

	South Road						South Road						Hartwell Road						Total
	from North						from South						from West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	2
Total	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	2
Grand Total	0	3	0	0	0	3	2	0	0	0	0	2	0	0	0	0	0	0	5
Approach %	0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total %	0.0	60.0	0.0	0.0	0.0	60.0	40.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	2						3						0						5

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:45 AM	South Road						South Road						Hartwell Road						Total
	from North						from South						from West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% Approach Total	0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250
Entering Leg	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Exiting Leg	0						2						0						2
Total	2						2						0						4

PDI File #: 176038 J
 Location: N: South Road S: South Road
 Location: W: Hartwell Road
 City, State: Bedford, MA
 Client: Fitzgerald & Halliday/M. Morehouse
 Site Code: TBA
 Count Date: Thursday, April 05, 2018
 Start Time: 6:00 AM
 End Time: 9:00 AM
 Class:



Pedestrians

	South Road						South Road						Hartwell Road						Total
	from North						from South						from West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100	100
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	100	100
Exiting Leg Total	0						0						1						1

Peak Hour Analysis from 06:00 AM to 09:00 AM begins at:

6:00 AM	South Road						South Road						Hartwell Road						Total	
	from North						from South						from West							
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total		
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100	100
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.250
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Exiting Leg	0						0						1						1	
Total	0						0						2						2	

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars and Heavy Vehicles (Combined)

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	15	28	0	43	108	15	0	123	16	21	0	37	203
3:15 PM	16	25	0	41	121	15	0	136	11	18	0	29	206
3:30 PM	12	41	0	53	184	15	0	199	24	14	0	38	290
3:45 PM	18	28	0	46	192	17	0	209	6	9	0	15	270
Total	61	122	0	183	605	62	0	667	57	62	0	119	969
4:00 PM	23	22	0	45	187	29	0	216	22	17	0	39	300
4:15 PM	22	25	0	47	167	25	0	192	13	17	0	30	269
4:30 PM	17	24	0	41	239	37	0	276	17	26	0	43	360
4:45 PM	18	27	0	45	173	25	0	198	20	31	0	51	294
Total	80	98	0	178	766	116	0	882	72	91	0	163	1223
5:00 PM	27	27	0	54	215	44	0	259	26	23	0	49	362
5:15 PM	22	34	0	56	250	41	0	291	16	23	0	39	386
5:30 PM	13	41	0	54	201	31	0	232	16	14	0	30	316
5:45 PM	27	29	0	56	156	41	0	197	11	15	0	26	279
Total	89	131	0	220	822	157	0	979	69	75	0	144	1343
Grand Total	230	351	0	581	2193	335	0	2528	198	228	0	426	3535
Approach %	39.6	60.4	0.0		86.7	13.3	0.0		46.5	53.5	0.0		
Total %	6.5	9.9	0.0	16.4	62.0	9.5	0.0	71.5	5.6	6.4	0.0	12.1	
Exiting Leg Total				2421				549				565	3535
Cars	225	346	0	571	2176	327	0	2503	193	223	0	416	3490
% Cars	97.8	98.6	0.0	98.3	99.2	97.6	0.0	99.0	97.5	97.8	0.0	97.7	98.7
Exiting Leg Total				2399				539				552	3490
Heavy Vehicles	5	5	0	10	17	8	0	25	5	5	0	10	45
% Heavy Vehicles	2.2	1.4	0.0	1.7	0.8	2.4	0.0	1.0	2.5	2.2	0.0	2.3	1.3
Exiting Leg Total				22				10				13	45

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
4:30 PM	17	24	0	41	239	37	0	276	17	26	0	43	360
4:45 PM	18	27	0	45	173	25	0	198	20	31	0	51	294
5:00 PM	27	27	0	54	215	44	0	259	26	23	0	49	362
5:15 PM	22	34	0	56	250	41	0	291	16	23	0	39	386
Total Volume	84	112	0	196	877	147	0	1024	79	103	0	182	1402
% Approach Total	42.9	57.1	0.0		85.6	14.4	0.0		43.4	56.6	0.0		
PHF	0.778	0.824	0.000	0.875	0.877	0.835	0.000	0.880	0.760	0.831	0.000	0.892	0.908
Cars	82	111	0	193	872	146	0	1018	78	101	0	179	1390
Cars %	97.6	99.1	0.0	98.5	99.4	99.3	0.0	99.4	98.7	98.1	0.0	98.4	99.1
Heavy Vehicles	2	1	0	3	5	1	0	6	1	2	0	3	12
Heavy Vehicles %	2.4	0.9	0.0	1.5	0.6	0.7	0.0	0.6	1.3	1.9	0.0	1.6	0.9
Cars Enter Leg	82	111	0	193	872	146	0	1018	78	101	0	179	1390
Heavy Enter Leg	2	1	0	3	5	1	0	6	1	2	0	3	12
Total Entering Leg	84	112	0	196	877	147	0	1024	79	103	0	182	1402
Cars Exiting Leg				973				189				228	1390
Heavy Exiting Leg				7				2				3	12
Total Exiting Leg				980				191				231	1402

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars-Combined (Motorcycles, Cars, Light Goods)

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	15	27	0	42	106	14	0	120	16	21	0	37	199
3:15 PM	16	24	0	40	120	13	0	133	10	18	0	28	201
3:30 PM	12	41	0	53	183	15	0	198	23	14	0	37	288
3:45 PM	16	27	0	43	190	14	0	204	5	9	0	14	261
Total	59	119	0	178	599	56	0	655	54	62	0	116	949
4:00 PM	22	21	0	43	185	29	0	214	21	17	0	38	295
4:15 PM	22	25	0	47	166	25	0	191	13	16	0	29	267
4:30 PM	17	24	0	41	237	36	0	273	17	26	0	43	357
4:45 PM	18	27	0	45	171	25	0	196	19	30	0	49	290
Total	79	97	0	176	759	115	0	874	70	89	0	159	1209
5:00 PM	27	27	0	54	214	44	0	258	26	22	0	48	360
5:15 PM	20	33	0	53	250	41	0	291	16	23	0	39	383
5:30 PM	13	41	0	54	201	30	0	231	16	13	0	29	314
5:45 PM	27	29	0	56	153	41	0	194	11	14	0	25	275
Total	87	130	0	217	818	156	0	974	69	72	0	141	1332
Grand Total	225	346	0	571	2176	327	0	2503	193	223	0	416	3490
Approach %	39.4	60.6	0.0		86.9	13.1	0.0		46.4	53.6	0.0		
Total %	6.4	9.9	0.0	16.4	62.3	9.4	0.0	71.7	5.5	6.4	0.0	11.9	
Exiting Leg Total				2399				539				552	3490

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
4:30 PM	17	24	0	41	237	36	0	273	17	26	0	43	357
4:45 PM	18	27	0	45	171	25	0	196	19	30	0	49	290
5:00 PM	27	27	0	54	214	44	0	258	26	22	0	48	360
5:15 PM	20	33	0	53	250	41	0	291	16	23	0	39	383
Total Volume	82	111	0	193	872	146	0	1018	78	101	0	179	1390
% Approach Total	42.5	57.5	0.0		85.7	14.3	0.0		43.6	56.4	0.0		
PHF	0.759	0.841	0.000	0.894	0.872	0.830	0.000	0.875	0.750	0.842	0.000	0.913	0.907
Entering Leg	82	111	0	193	872	146	0	1018	78	101	0	179	1390
Exiting Leg				973				189				228	1390
Total				1166				1207				407	2780

PDI File #: **176038 J**
Location: **N: South Road S: South Road**
Location: **W: Hartwell Road**
City, State: **Bedford, MA**
Client: **Fitzgerald & Halliday/M. Morehouse**
Site Code: **TBA**
Count Date: **Thursday, April 05, 2018**
Start Time: **3:00 PM**
End Time: **6:00 PM**
Class: **Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**



	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	0	1	0	1	2	1	0	3	0	0	0	0	4
3:15 PM	0	1	0	1	1	2	0	3	1	0	0	1	5
3:30 PM	0	0	0	0	1	0	0	1	1	0	0	1	2
3:45 PM	2	1	0	3	2	3	0	5	1	0	0	1	9
Total	2	3	0	5	6	6	0	12	3	0	0	3	20
4:00 PM	1	1	0	2	2	0	0	2	1	0	0	1	5
4:15 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
4:30 PM	0	0	0	0	2	1	0	3	0	0	0	0	3
4:45 PM	0	0	0	0	2	0	0	2	1	1	0	2	4
Total	1	1	0	2	7	1	0	8	2	2	0	4	14
5:00 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
5:15 PM	2	1	0	3	0	0	0	0	0	0	0	0	3
5:30 PM	0	0	0	0	0	1	0	1	0	1	0	1	2
5:45 PM	0	0	0	0	3	0	0	3	0	1	0	1	4
Total	2	1	0	3	4	1	0	5	0	3	0	3	11
Grand Total	5	5	0	10	17	8	0	25	5	5	0	10	45
Approach %	50.0	50.0	0.0		68.0	32.0	0.0		50.0	50.0	0.0		
Total %	11.1	11.1	0.0	22.2	37.8	17.8	0.0	55.6	11.1	11.1	0.0	22.2	
Exiting Leg Total	22				10				13				45
Buses	0	3	0	3	5	5	0	10	4	1	0	5	18
% Buses	0.0	60.0	0.0	30.0	29.4	62.5	0.0	40.0	80.0	20.0	0.0	50.0	40.0
Exiting Leg Total	6				7				5				18
Single-Unit Trucks	5	2	0	7	11	2	0	13	1	4	0	5	25
% Single-Unit	100.0	40.0	0.0	70.0	64.7	25.0	0.0	52.0	20.0	80.0	0.0	50.0	55.6
Exiting Leg Total	15				3				7				25
Articulated Trucks	0	0	0	0	1	1	0	2	0	0	0	0	2
% Articulated	0.0	0.0	0.0	0.0	5.9	12.5	0.0	8.0	0.0	0.0	0.0	0.0	4.4
Exiting Leg Total	1				0				1				2

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:15 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:15 PM	0	1	0	1	1	2	0	3	1	0	0	1	5
3:30 PM	0	0	0	0	1	0	0	1	1	0	0	1	2
3:45 PM	2	1	0	3	2	3	0	5	1	0	0	1	9
4:00 PM	1	1	0	2	2	0	0	2	1	0	0	1	5
Total Volume	3	3	0	6	6	5	0	11	4	0	0	4	21
% Approach Total	50.0	50.0	0.0		54.5	45.5	0.0		100.0	0.0	0.0		
PHF	0.375	0.750	0.000	0.500	0.750	0.417	0.000	0.550	1.000	0.000	0.000	1.000	0.583
Buses	0	2	0	2	2	3	0	5	3	0	0	3	10
Buses %	0.0	66.7	0.0	33.3	33.3	60.0	0.0	45.5	75.0	0.0	0.0	75.0	47.6
Single-Unit Trucks	3	1	0	4	4	1	0	5	1	0	0	1	10
Single-Unit %	100.0	33.3	0.0	66.7	66.7	20.0	0.0	45.5	25.0	0.0	0.0	25.0	47.6
Articulated Trucks	0	0	0	0	0	1	0	1	0	0	0	0	1
Articulated %	0.0	0.0	0.0	0.0	0.0	20.0	0.0	9.1	0.0	0.0	0.0	0.0	4.8
Buses	0	2	0	2	2	3	0	5	3	0	0	3	10
Single-Unit Trucks	3	1	0	4	4	1	0	5	1	0	0	1	10
Articulated Trucks	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Entering Leg	3	3	0	6	6	5	0	11	4	0	0	4	21
Buses	2				5				3				10
Single-Unit Trucks	4				2				4				10
Articulated Trucks	0				0				1				1
Total Exiting Leg	6				7				8				21

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Cars

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	14	24	0	38	91	13	0	104	14	19	0	33	175
3:15 PM	16	21	0	37	106	13	0	119	9	16	0	25	181
3:30 PM	11	35	0	46	154	15	0	169	22	14	0	36	251
3:45 PM	15	23	0	38	164	11	0	175	4	8	0	12	225
Total	56	103	0	159	515	52	0	567	49	57	0	106	832
4:00 PM	20	17	0	37	160	28	0	188	18	15	0	33	258
4:15 PM	21	22	0	43	147	24	0	171	13	14	0	27	241
4:30 PM	15	22	0	37	211	34	0	245	16	23	0	39	321
4:45 PM	18	25	0	43	155	20	0	175	18	28	0	46	264
Total	74	86	0	160	673	106	0	779	65	80	0	145	1084
5:00 PM	26	24	0	50	195	36	0	231	24	19	0	43	324
5:15 PM	20	29	0	49	230	40	0	270	16	23	0	39	358
5:30 PM	12	34	0	46	183	30	0	213	14	11	0	25	284
5:45 PM	24	27	0	51	140	38	0	178	11	14	0	25	254
Total	82	114	0	196	748	144	0	892	65	67	0	132	1220
Grand Total	212	303	0	515	1936	302	0	2238	179	204	0	383	3136
Approach %	41.2	58.8	0.0		86.5	13.5	0.0		46.7	53.3	0.0		
Total %	6.8	9.7	0.0	16.4	61.7	9.6	0.0	71.4	5.7	6.5	0.0	12.2	
Exiting Leg Total				2140				482				514	3136

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

4:30 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
4:30 PM	15	22	0	37	211	34	0	245	16	23	0	39	321
4:45 PM	18	25	0	43	155	20	0	175	18	28	0	46	264
5:00 PM	26	24	0	50	195	36	0	231	24	19	0	43	324
5:15 PM	20	29	0	49	230	40	0	270	16	23	0	39	358
Total Volume	79	100	0	179	791	130	0	921	74	93	0	167	1267
% Approach Total	44.1	55.9	0.0		85.9	14.1	0.0		44.3	55.7	0.0		
PHF	0.760	0.862	0.000	0.895	0.860	0.813	0.000	0.853	0.771	0.830	0.000	0.908	0.885
Entering Leg	79	100	0	179	791	130	0	921	74	93	0	167	1267
Exiting Leg				884				174				209	1267
Total				1063				1095				376	2534

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Light Goods Vehicle

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	1	3	0	4	15	1	0	16	2	2	0	4	24
3:15 PM	0	3	0	3	14	0	0	14	1	2	0	3	20
3:30 PM	1	6	0	7	29	0	0	29	1	0	0	1	37
3:45 PM	1	4	0	5	26	3	0	29	1	1	0	2	36
Total	3	16	0	19	84	4	0	88	5	5	0	10	117
4:00 PM	2	4	0	6	25	1	0	26	3	2	0	5	37
4:15 PM	1	2	0	3	19	1	0	20	0	2	0	2	25
4:30 PM	2	2	0	4	26	2	0	28	1	3	0	4	36
4:45 PM	0	2	0	2	16	5	0	21	1	2	0	3	26
Total	5	10	0	15	86	9	0	95	5	9	0	14	124
5:00 PM	1	3	0	4	19	8	0	27	2	3	0	5	36
5:15 PM	0	4	0	4	20	1	0	21	0	0	0	0	25
5:30 PM	1	7	0	8	18	0	0	18	2	2	0	4	30
5:45 PM	3	2	0	5	12	3	0	15	0	0	0	0	20
Total	5	16	0	21	69	12	0	81	4	5	0	9	111
Grand Total	13	42	0	55	239	25	0	264	14	19	0	33	352
Approach %	23.6	76.4	0.0		90.5	9.5	0.0		42.4	57.6	0.0		
Total %	3.7	11.9	0.0	15.6	67.9	7.1	0.0	75.0	4.0	5.4	0.0	9.4	
Exiting Leg Total				258				56				38	352

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:30 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:30 PM	1	6	0	7	29	0	0	29	1	0	0	1	37
3:45 PM	1	4	0	5	26	3	0	29	1	1	0	2	36
4:00 PM	2	4	0	6	25	1	0	26	3	2	0	5	37
4:15 PM	1	2	0	3	19	1	0	20	0	2	0	2	25
Total Volume	5	16	0	21	99	5	0	104	5	5	0	10	135
% Approach Total	23.8	76.2	0.0		95.2	4.8	0.0		50.0	50.0	0.0		
PHF	0.625	0.667	0.000	0.750	0.853	0.417	0.000	0.897	0.417	0.625	0.000	0.500	0.912
Entering Leg	5	16	0	21	99	5	0	104	5	5	0	10	135
Exiting Leg				104				21				10	135
Total				125				125				20	270

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Buses

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	0	1	0	1	1	1	0	2	0	0	0	0	3
3:15 PM	0	0	0	0	0	2	0	2	1	0	0	1	3
3:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
3:45 PM	0	1	0	1	2	1	0	3	0	0	0	0	4
Total	0	2	0	2	3	4	0	7	2	0	0	2	11
4:00 PM	0	1	0	1	0	0	0	0	1	0	0	1	2
4:15 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
4:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	1	0	1	1	1	0	2	2	0	0	2	5
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
Total	0	0	0	0	1	0	0	1	0	1	0	1	2
Grand Total	0	3	0	3	5	5	0	10	4	1	0	5	18
Approach %	0.0	100.0	0.0		50.0	50.0	0.0		80.0	20.0	0.0		
Total %	0.0	16.7	0.0	16.7	27.8	27.8	0.0	55.6	22.2	5.6	0.0	27.8	
Exiting Leg Total	6				7				5				18

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	0	1	0	1	1	1	0	2	0	0	0	0	3
3:15 PM	0	0	0	0	0	2	0	2	1	0	0	1	3
3:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	1
3:45 PM	0	1	0	1	2	1	0	3	0	0	0	0	4
Total Volume	0	2	0	2	3	4	0	7	2	0	0	2	11
% Approach Total	0.0	100.0	0.0		42.9	57.1	0.0		100.0	0.0	0.0		
PHF	0.000	0.500	0.000	0.500	0.375	0.500	0.000	0.583	0.500	0.000	0.000	0.500	0.688
Entering Leg	0	2	0	2	3	4	0	7	2	0	0	2	11
Exiting Leg				3				4				4	11
Total				5				11				6	22

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Single-Unit Trucks

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
3:15 PM	0	1	0	1	1	0	0	1	0	0	0	0	2
3:30 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
3:45 PM	2	0	0	2	0	1	0	1	1	0	0	1	4
Total	2	1	0	3	3	1	0	4	1	0	0	1	8
4:00 PM	1	0	0	1	2	0	0	2	0	0	0	0	3
4:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
4:30 PM	0	0	0	0	2	0	0	2	0	0	0	0	2
4:45 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
Total	1	0	0	1	5	0	0	5	0	2	0	2	8
5:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
5:15 PM	2	1	0	3	0	0	0	0	0	0	0	0	3
5:30 PM	0	0	0	0	0	1	0	1	0	1	0	1	2
5:45 PM	0	0	0	0	2	0	0	2	0	1	0	1	3
Total	2	1	0	3	3	1	0	4	0	2	0	2	9
Grand Total	5	2	0	7	11	2	0	13	1	4	0	5	25
Approach %	71.4	28.6	0.0		84.6	15.4	0.0		20.0	80.0	0.0		
Total %	20.0	8.0	0.0	28.0	44.0	8.0	0.0	52.0	4.0	16.0	0.0	20.0	
Exiting Leg Total	15				3				7				25

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:15 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:15 PM	0	1	0	1	1	0	0	1	0	0	0	0	2
3:30 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
3:45 PM	2	0	0	2	0	1	0	1	1	0	0	1	4
4:00 PM	1	0	0	1	2	0	0	2	0	0	0	0	3
Total Volume	3	1	0	4	4	1	0	5	1	0	0	1	10
% Approach Total	75.0	25.0	0.0		80.0	20.0	0.0		100.0	0.0	0.0		
PHF	0.375	0.250	0.000	0.500	0.500	0.250	0.000	0.625	0.250	0.000	0.000	0.250	0.625
Entering Leg	3	1	0	4	4	1	0	5	1	0	0	1	10
Exiting Leg				4				2				4	10
Total				8				7				5	20

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Articulated Trucks

	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total	0	0	0	0	0	1	0	1	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
Total	0	0	0	0	1	0	0	1	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	1	1	0	2	0	0	0	0	2
Approach %	0.0	0.0	0.0		50.0	50.0	0.0		0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	50.0	50.0	0.0	100.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	1				0				1				2

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	South Road				South Road				Hartwell Road				Total
	from North				from South				from West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
Total Volume	0	0	0	0	0	1	0	1	0	0	0	0	1
% Approach Total	0.0	0.0	0.0		0.0	100.0	0.0		0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.250
Entering Leg	0	0	0	0	0	1	0	1	0	0	0	0	1
Exiting Leg				0				0				1	1
Total				0				1				1	2

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Bicycles (on Roadway and Crosswalks)

	South Road						South Road						Hartwell Road						Total
	from North						from South						from West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	2
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	2	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	3
Approach %	0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		
Total %	0.0	66.7	0.0	0.0	0.0	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	33.3	
Exiting Leg Total	1						2						0						3

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:45 PM	South Road						South Road						Hartwell Road						Total		
	from North						from South						from West								
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total			
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:00 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	
Total Volume	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	2	
% Approach Total	0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0				
PHF	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.500		
Entering Leg	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	2	
Exiting Leg	1						1						0						0		2
Total	2						1						1						1		4

PDI File #: **176038 J**
 Location: **N: South Road S: South Road**
 Location: **W: Hartwell Road**
 City, State: **Bedford, MA**
 Client: **Fitzgerald & Halliday/M. Morehouse**
 Site Code: **TBA**
 Count Date: **Thursday, April 05, 2018**
 Start Time: **3:00 PM**
 End Time: **6:00 PM**
 Class:



Pedestrians

	South Road						South Road						Hartwell Road						Total
	from North						from South						from West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg Total	0						0						0						0

Peak Hour Analysis from 03:00 PM to 06:00 PM begins at:

3:00 PM	South Road						South Road						Hartwell Road						Total	
	from North						from South						from West							
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total		
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0						0						0						0	
Total	0						0						0						0	

Appendix C-3

2018 Automatic Traffic Recorder (ATR) Counts



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 A Volume
Site Code: TBA

Start Time	4/5/2018		4/6/2018		4/7/2018		4/8/2018		4/9/2018		4/10/2018		4/11/2018		Week Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	7	15	9	20	24	29	18	38	23	12	17	12	11	22	16	21
01:00	48	12	6	13	9	16	6	26	9	8	8	6	34	7	17	13
02:00	8	6	49	11	9	18	9	16	4	3	8	7	19	3	15	9
03:00	7	7	14	8	4	5	4	10	3	4	4	4	7	7	6	6
04:00	27	18	25	19	8	10	4	13	31	28	35	25	29	23	23	19
05:00	157	213	124	182	28	35	11	20	140	225	157	222	136	211	108	158
06:00	490	515	424	450	59	108	43	83	533	495	522	522	506	511	368	383
07:00	870	676	711	627	150	160	109	92	841	639	960	679	927	643	653	502
08:00	875	648	800	672	263	219	192	146	860	593	841	684	856	615	670	511
09:00	840	528	579	469	320	271	266	209	643	545	714	594	742	571	586	455
10:00	453	428	420	389	362	355	306	310	386	383	412	396	416	410	394	382
11:00	416	449	444	434	360	389	335	316	380	378	412	358	419	446	395	396
12:00 PM	451	477	390	420	396	416	391	450	374	451	423	476	444	469	410	451
01:00	419	443	431	402	416	489	412	449	371	405	419	418	443	462	416	438
02:00	536	583	485	651	437	503	365	413	515	499	496	552	517	558	479	537
03:00	572	900	474	692	423	411	348	404	544	768	526	862	563	824	493	694
04:00	479	1048	365	852	465	384	330	338	494	925	493	1036	471	1014	442	800
05:00	484	1059	357	973	352	315	292	272	453	965	429	974	447	945	402	786
06:00	343	660	314	656	278	282	221	273	328	628	359	684	375	658	317	549
07:00	235	364	232	247	192	241	159	167	235	307	212	316	247	341	216	283
08:00	132	219	147	190	105	168	103	143	108	208	127	182	138	227	123	191
09:00	114	168	96	162	85	159	63	84	104	147	93	180	86	166	92	152
10:00	66	82	86	154	83	144	62	53	45	66	66	78	62	89	67	95
11:00	42	45	70	62	64	76	44	20	39	45	34	44	42	61	48	50
Total Day	8071	9563	7052	8755	4892	5203	4093	4345	7463	8727	7767	9311	7937	9283	6756	7881
	17634		15807		10095		8438		16190		17078		17220		14637	
AM Peak	08:00	07:00	08:00	08:00	10:00	11:00	11:00	11:00	08:00	07:00	07:00	08:00	07:00	07:00	08:00	08:00
Vol.	875	676	800	672	362	389	335	316	860	639	960	684	927	643	670	511
PM Peak	15:00	17:00	14:00	17:00	16:00	14:00	13:00	12:00	15:00	17:00	15:00	16:00	15:00	16:00	15:00	16:00
Vol.	572	1059	485	973	465	503	412	450	544	965	526	1036	563	1014	493	800

Comb. Total	17634	15807	10095	8438	16190	17078	17220	14637
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ADT	ADT 14,637	AADT 14,637
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PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start Time	4/5/2018		4/6/2018		4/7/2018		4/8/2018		4/9/2018		4/10/2018		4/11/2018		Week Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	3	4	5	3	2	3	6	1	4	2	7	2	3	3	4	3
01:00	1	2	3	1	4	3	2	2	0	0	2	3	1	4	2	2
02:00	2	1	2	1	5	1	2	1	2	1	2	2	0	0	2	1
03:00	1	1	1	1	0	1	0	1	0	1	1	0	1	1	1	1
04:00	2	4	4	3	1	1	1	1	2	5	3	5	3	6	2	4
05:00	16	21	17	23	0	4	3	6	23	30	18	31	18	24	14	20
06:00	67	174	49	126	10	11	5	5	58	174	78	196	71	184	48	124
07:00	151	326	169	230	28	29	11	6	194	313	180	325	187	321	131	221
08:00	200	326	163	222	60	48	20	30	199	342	199	286	174	291	145	221
09:00	119	234	106	106	78	90	28	37	102	163	122	189	171	198	104	145
10:00	60	78	66	72	135	102	54	56	58	58	62	80	103	103	77	78
11:00	65	72	58	89	130	94	63	47	56	61	67	68	96	98	76	76
12:00 PM	81	88	83	73	124	116	70	88	81	68	79	70	140	130	94	90
01:00	66	72	67	61	130	126	68	90	63	61	63	58	104	104	80	82
02:00	85	110	109	182	130	92	70	56	77	100	75	113	121	155	95	115
03:00	126	316	150	308	101	114	53	56	93	172	130	256	135	269	113	213
04:00	134	300	113	366	63	92	60	50	131	289	137	393	118	306	108	257
05:00	123	351	114	228	54	62	50	53	123	249	118	258	113	290	99	213
06:00	83	117	82	99	44	55	30	42	88	123	93	123	96	132	74	99
07:00	54	52	35	46	26	39	33	19	51	37	46	52	55	57	43	43
08:00	35	32	26	27	18	21	19	19	22	35	19	28	26	31	24	28
09:00	19	15	24	23	14	23	13	9	15	22	15	8	24	20	18	17
10:00	9	7	17	19	20	20	7	6	11	7	15	5	11	6	13	10
11:00	9	9	9	6	17	11	5	6	5	8	7	4	4	7	8	7
Total Day	1511	2712	1472	2315	1194	1158	673	687	1458	2321	1538	2555	1775	2740	1375	2070
	4223		3787		2352		1360		3779		4093		4515		3445	
AM Peak	08:00	07:00	07:00	07:00	10:00	10:00	11:00	10:00	08:00	08:00	08:00	07:00	07:00	07:00	08:00	07:00
Vol.	200	326	169	230	135	102	63	56	199	342	199	325	187	321	145	221
PM Peak	16:00	17:00	15:00	16:00	13:00	13:00	12:00	13:00	16:00	16:00	16:00	16:00	12:00	16:00	15:00	16:00
Vol.	134	351	150	366	130	126	70	90	131	289	137	393	140	306	113	257

Comb. Total	4223	3787	2352	1360	3779	4093	4515	3445
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ADT	ADT 3,444	AADT 3,444
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PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

11 Cambridge Turnpike Cutoff
south of Lexington Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Volume
Site Code: TBA

Start Time	4/5/2018		4/6/2018		4/7/2018		4/8/2018		4/9/2018		4/10/2018		4/11/2018		Week Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	5	8	4	16	11	23	15	25	10	13	6	9	5	12	8	15
01:00	3	13	6	11	6	10	7	20	4	6	5	1	1	6	5	10
02:00	6	6	5	7	5	14	10	10	2	3	5	6	10	3	6	7
03:00	7	5	8	4	3	2	2	3	3	4	3	3	7	4	5	4
04:00	21	9	20	7	6	5	3	6	20	6	27	10	26	7	18	7
05:00	187	40	164	45	22	10	7	11	186	43	203	45	185	54	136	35
06:00	366	151	313	143	45	74	24	49	367	149	431	153	378	153	275	125
07:00	754	278	577	272	101	66	63	52	741	292	826	288	837	283	557	219
08:00	776	363	590	317	138	113	120	77	797	346	672	339	705	349	543	272
09:00	523	241	375	221	164	117	140	96	388	291	451	279	403	298	349	220
10:00	241	193	227	174	180	178	181	159	199	179	228	194	237	195	213	182
11:00	221	218	180	193	208	206	151	161	175	188	175	179	184	220	185	195
12:00 PM	200	255	156	217	219	217	202	247	183	208	201	224	213	246	196	231
01:00	173	233	183	239	185	232	210	239	157	235	166	211	195	250	181	234
02:00	209	346	191	400	192	249	164	197	165	319	170	356	176	360	181	318
03:00	298	501	304	442	169	247	147	209	253	414	274	500	289	457	248	396
04:00	296	534	245	560	169	231	140	156	273	491	315	551	259	558	242	440
05:00	344	547	263	620	150	158	133	146	312	481	309	521	346	580	265	436
06:00	233	349	203	335	129	163	125	133	182	350	217	348	230	378	188	294
07:00	131	210	103	156	82	136	91	106	117	189	97	185	130	246	107	175
08:00	80	138	73	90	62	93	68	87	65	118	71	119	91	143	73	113
09:00	59	119	56	84	45	74	37	48	53	81	53	113	55	110	51	90
10:00	27	47	40	91	43	93	26	44	21	46	32	39	43	61	33	60
11:00	32	30	35	49	37	37	17	15	25	32	18	31	16	34	26	33
Total Day	5192	4834	4321	4693	2371	2748	2083	2296	4698	4484	4955	4704	5021	5007	4091	4111
	10026		9014		5119		4379		9182		9659		10028		8202	
AM Peak	08:00	08:00	08:00	08:00	11:00	11:00	10:00	11:00	08:00	08:00	07:00	08:00	07:00	08:00	07:00	08:00
Vol.	776	363	590	317	208	206	181	161	797	346	826	339	837	349	557	272
PM Peak	17:00	17:00	15:00	17:00	12:00	14:00	13:00	12:00	17:00	16:00	16:00	16:00	17:00	17:00	17:00	16:00
Vol.	344	547	304	620	219	249	210	247	312	491	315	551	346	580	265	440

Comb. Total	10026	9014	5119	4379	9182	9659	10028	8202
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ADT	ADT 8,201	AADT 8,201
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PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 D Volume
Site Code: TBA

Start Time	4/5/2018		4/6/2018		4/7/2018		4/8/2018		4/9/2018		4/10/2018		4/11/2018		Week Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	9	3	13	4	14	6	13	1	2	3	10	3	9	3	10	3
01:00	3	2	5	1	5	0	4	4	1	0	2	0	2	1	3	1
02:00	2	1	0	2	2	0	5	0	1	0	1	0	2	1	2	1
03:00	1	2	2	2	1	0	2	0	1	6	2	4	3	4	2	3
04:00	5	7	4	4	3	2	0	0	6	6	6	7	3	6	4	5
05:00	8	40	5	33	4	3	3	6	6	49	9	43	10	38	6	30
06:00	34	217	36	184	9	18	3	13	43	197	37	188	55	209	31	147
07:00	112	383	117	339	35	54	22	29	124	402	129	404	133	373	96	283
08:00	197	439	165	345	62	87	55	63	212	441	190	447	193	464	153	327
09:00	135	216	131	168	95	94	78	84	123	262	129	221	139	268	119	188
10:00	76	113	96	111	113	111	115	90	94	110	102	101	91	114	98	107
11:00	128	95	117	106	141	117	125	112	113	96	108	107	115	131	121	109
12:00 PM	151	116	137	102	113	212	144	118	111	104	165	108	172	130	142	127
01:00	123	93	144	104	134	134	129	132	139	113	129	102	179	106	140	112
02:00	178	123	233	142	181	129	135	83	182	108	158	119	190	131	180	119
03:00	435	146	589	135	181	106	107	83	425	128	439	129	461	151	377	125
04:00	706	108	482	179	129	89	117	88	547	115	668	143	580	149	461	124
05:00	606	170	489	146	131	100	112	82	625	122	642	126	554	183	451	133
06:00	297	96	198	81	79	91	88	62	263	105	270	85	271	107	209	90
07:00	152	64	89	50	60	61	68	35	122	55	97	62	127	65	102	56
08:00	70	37	58	31	40	25	48	20	56	35	76	40	74	33	60	32
09:00	65	30	42	30	44	28	28	18	43	24	37	20	57	32	45	26
10:00	32	22	49	18	36	31	20	11	32	12	38	24	40	18	35	19
11:00	16	7	28	19	37	17	12	7	15	5	21	2	20	8	21	9
Total Day	3541	2530	3229	2336	1649	1515	1433	1141	3286	2498	3465	2485	3480	2725	2868	2176
	6071		5565		3164		2574		5784		5950		6205		5044	
AM Peak	08:00	08:00	08:00	08:00	11:00	11:00	11:00	11:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00	08:00
Vol.	197	439	165	345	141	117	125	112	212	441	190	447	193	464	153	327
PM Peak	16:00	17:00	15:00	16:00	14:00	12:00	12:00	13:00	17:00	15:00	16:00	16:00	16:00	17:00	16:00	17:00
Vol.	706	170	589	179	181	212	144	132	625	128	668	143	580	183	461	133

Comb. Total	6071	5565	3164	2574	5784	5950	6205	5044
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ADT	ADT 5,045	AADT 5,045
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PRECISION
D A T A
INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 E Volume
Site Code: TBA

Start Time	4/5/2018		4/6/2018		4/7/2018		4/8/2018		4/9/2018		4/10/2018		4/11/2018		Week Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	5	9	6	13	10	13	10	14	1	11	2	3	4	7	5	10
01:00	3	5	1	3	3	2	6	6	2	3	2	1	0	4	2	3
02:00	4	4	4	1	2	2	1	2	1	2	1	2	2	2	2	2
03:00	6	1	4	3	2	3	3	2	6	3	5	3	6	2	5	2
04:00	14	6	7	5	5	2	1	1	8	12	15	7	15	10	9	6
05:00	60	37	52	25	6	10	3	10	65	35	66	39	59	36	44	27
06:00	180	102	161	106	34	22	29	20	182	109	165	106	173	110	132	82
07:00	358	185	347	212	61	74	48	54	370	209	380	190	385	223	278	164
08:00	387	236	342	219	109	108	93	81	382	229	362	240	370	280	292	199
09:00	272	193	273	186	190	131	145	124	244	194	228	221	282	227	233	182
10:00	192	169	180	172	175	180	132	143	201	133	198	167	196	172	182	162
11:00	167	190	197	168	187	193	186	214	138	168	160	180	162	209	171	189
12:00 PM	186	196	188	214	213	227	191	200	166	203	202	202	202	196	193	205
01:00	171	212	175	208	240	239	215	222	152	190	165	199	175	219	185	213
02:00	177	269	186	289	193	267	157	197	161	215	171	257	179	273	175	252
03:00	207	409	214	582	181	238	185	163	201	431	212	459	234	468	205	393
04:00	188	686	182	591	187	208	133	200	177	586	196	674	229	587	185	505
05:00	200	633	186	634	153	201	148	184	207	689	207	646	208	630	187	517
06:00	147	375	157	288	138	173	110	131	166	351	163	334	172	338	150	284
07:00	117	174	99	119	98	137	84	100	109	148	104	155	124	150	105	140
08:00	66	102	67	94	76	86	47	67	60	67	74	85	86	140	68	92
09:00	87	75	60	53	61	62	28	34	47	54	50	73	64	111	57	66
10:00	41	40	30	66	54	51	12	32	25	35	27	44	24	41	30	44
11:00	25	36	33	28	36	37	10	13	11	15	17	21	24	23	22	25
Total Day	3260	4344	3151	4279	2414	2666	1977	2214	3082	4092	3172	4308	3375	4458	2917	3764
	7604		7430		5080		4191		7174		7480		7833		6681	
AM Peak	08:00	08:00	07:00	08:00	09:00	11:00	11:00	11:00	08:00	08:00	07:00	08:00	07:00	08:00	08:00	08:00
Vol.	387	236	347	219	190	193	186	214	382	229	380	240	385	280	292	199
PM Peak	15:00	16:00	15:00	17:00	13:00	14:00	13:00	13:00	17:00	17:00	15:00	16:00	15:00	17:00	15:00	17:00
Vol.	207	686	214	634	240	267	215	222	207	689	212	674	234	630	205	517

Comb. Total	7604	7430	5080	4191	7174	7480	7833	6681
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ADT	ADT 6,685	AADT 6,685
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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 F Volume
Site Code: TBA

Start Time	4/5/2018		4/6/2018		4/7/2018		4/8/2018		4/9/2018		4/10/2018		4/11/2018		Week Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	4	2	0	2	2	7	1	8	2	15	1	3	3	2	2	6
01:00	2	46	1	1	1	3	0	1	3	9	0	2	3	40	1	15
02:00	0	6	7	43	0	0	1	0	0	0	0	2	0	9	1	9
03:00	2	2	5	8	4	2	1	0	1	0	2	0	3	3	3	2
04:00	7	0	11	3	4	0	9	4	14	4	11	0	11	3	10	2
05:00	57	7	60	10	11	2	13	2	62	5	62	7	65	7	47	6
06:00	62	18	66	18	21	15	31	9	72	23	68	16	47	23	52	17
07:00	54	24	68	30	38	9	28	6	69	33	79	32	61	20	57	22
08:00	57	22	90	32	37	14	19	9	78	32	75	32	67	30	60	24
09:00	94	41	80	36	27	12	21	19	80	40	99	46	99	47	71	34
10:00	74	49	56	53	37	34	31	20	72	46	60	59	78	43	58	43
11:00	74	65	51	65	24	31	16	27	54	57	38	43	57	58	45	49
12:00 PM	51	69	51	54	40	37	27	29	82	52	55	56	62	60	53	51
01:00	60	69	43	76	37	31	40	30	56	65	51	63	60	64	50	57
02:00	47	95	42	70	33	37	32	42	48	81	48	89	64	100	45	73
03:00	43	72	32	42	23	28	23	30	36	65	46	71	41	82	35	56
04:00	20	46	22	52	20	27	18	27	22	56	27	63	26	49	22	46
05:00	32	50	25	44	14	32	17	43	21	51	21	55	27	45	22	46
06:00	18	46	18	43	5	19	18	30	18	52	20	54	15	52	16	42
07:00	12	23	14	19	11	17	11	21	11	22	17	31	15	37	13	24
08:00	6	19	9	18	2	4	9	17	7	20	4	17	5	20	6	16
09:00	8	11	2	8	6	8	10	9	8	18	10	16	8	16	7	12
10:00	9	22	7	11	8	6	9	17	5	9	10	14	11	12	8	13
11:00	2	14	4	25	3	19	9	35	0	15	5	21	6	19	4	21
Total Day	795	818	764	763	408	394	394	435	821	770	809	792	834	841	688	686
AM Peak	09:00	11:00	08:00	11:00	07:00	10:00	06:00	11:00	09:00	11:00	09:00	10:00	09:00	11:00	09:00	11:00
Vol.	94	65	90	65	38	34	31	27	80	57	99	59	99	58	71	49
PM Peak	13:00	14:00	12:00	13:00	12:00	12:00	13:00	17:00	12:00	14:00	12:00	14:00	14:00	14:00	12:00	14:00
Vol.	60	95	51	76	40	37	40	43	82	81	55	89	64	100	53	73

Comb. Total	1613	1527	802	829	1591	1601	1675	1374
ADT	ADT 1,377	AADT 1,377						



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	4	3	0	0	0	0	0	0	0	0	0	0	7
01:00	0	37	9	0	2	0	0	0	0	0	0	0	0	48
02:00	0	5	2	1	0	0	0	0	0	0	0	0	0	8
03:00	0	3	2	1	1	0	0	0	0	0	0	0	0	7
04:00	0	21	4	0	2	0	0	0	0	0	0	0	0	27
05:00	0	122	24	1	9	0	0	0	1	0	0	0	0	157
06:00	0	369	85	6	21	4	2	2	1	0	0	0	0	490
07:00	2	732	103	4	18	6	0	4	1	0	0	0	0	870
08:00	8	743	98	3	13	8	1	1	0	0	0	0	0	875
09:00	0	677	130	8	20	4	0	0	1	0	0	0	0	840
10:00	3	343	80	3	13	7	2	1	1	0	0	0	0	453
11:00	2	319	65	6	21	2	0	1	0	0	0	0	0	416
12 PM	0	334	86	7	19	2	0	1	1	1	0	0	0	451
13:00	0	315	75	1	17	5	1	2	2	1	0	0	0	419
14:00	2	403	96	7	21	3	1	3	0	0	0	0	0	536
15:00	0	462	89	6	10	4	0	1	0	0	0	0	0	572
16:00	3	389	69	7	8	3	0	0	0	0	0	0	0	479
17:00	0	405	58	4	12	4	0	1	0	0	0	0	0	484
18:00	1	292	35	3	9	2	0	0	1	0	0	0	0	343
19:00	0	199	29	2	4	1	0	0	0	0	0	0	0	235
20:00	0	112	19	0	1	0	0	0	0	0	0	0	0	132
21:00	0	98	14	0	2	0	0	0	0	0	0	0	0	114
22:00	0	51	14	1	0	0	0	0	0	0	0	0	0	66
23:00	0	37	4	0	1	0	0	0	0	0	0	0	0	42
Total	21	6472	1193	71	224	55	7	17	9	2	0	0	0	8071
Percent	0.3%	80.2%	14.8%	0.9%	2.8%	0.7%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	09:00	09:00	06:00	08:00	06:00	07:00	05:00					08:00
Vol.	8	743	130	8	21	8	2	4	1					875
PM Peak	16:00	15:00	14:00	12:00	14:00	13:00	13:00	14:00	13:00	12:00				15:00
Vol.	3	462	96	7	21	5	1	3	2	1				572



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	9	0	0	0	0	0	0	0	0	0	0	0	9
01:00	0	5	0	0	0	0	0	0	0	1	0	0	0	6
02:00	0	34	14	0	1	0	0	0	0	0	0	0	0	49
03:00	0	9	1	2	2	0	0	0	0	0	0	0	0	14
04:00	0	15	5	0	4	0	0	1	0	0	0	0	0	25
05:00	0	96	26	0	1	0	0	0	1	0	0	0	0	124
06:00	0	338	67	5	12	2	0	0	0	0	0	0	0	424
07:00	2	599	83	3	17	5	0	1	1	0	0	0	0	711
08:00	3	661	99	8	18	8	1	2	0	0	0	0	0	800
09:00	2	463	76	7	19	7	0	2	3	0	0	0	0	579
10:00	1	308	74	5	23	4	0	0	5	0	0	0	0	420
11:00	0	330	80	7	18	2	0	3	4	0	0	0	0	444
12 PM	0	288	77	3	14	0	0	3	5	0	0	0	0	390
13:00	1	314	83	3	23	4	0	2	0	1	0	0	0	431
14:00	0	352	102	5	17	7	0	2	0	0	0	0	0	485
15:00	5	396	52	8	11	1	0	0	1	0	0	0	0	474
16:00	10	315	30	5	2	1	0	1	1	0	0	0	0	365
17:00	5	304	35	4	4	5	0	0	0	0	0	0	0	357
18:00	0	265	40	1	6	1	0	1	0	0	0	0	0	314
19:00	0	199	26	3	3	0	0	0	0	1	0	0	0	232
20:00	0	122	24	0	1	0	0	0	0	0	0	0	0	147
21:00	0	82	14	0	0	0	0	0	0	0	0	0	0	96
22:00	0	73	10	1	2	0	0	0	0	0	0	0	0	86
23:00	0	59	11	0	0	0	0	0	0	0	0	0	0	70
Total	29	5636	1029	70	198	47	1	18	21	3	0	0	0	7052
Percent	0.4%	79.9%	14.6%	1.0%	2.8%	0.7%	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	08:00	10:00	08:00	08:00	11:00	10:00	01:00				08:00
Vol.	3	661	99	8	23	8	1	3	5	1				800
PM Peak	16:00	15:00	14:00	15:00	13:00	14:00		12:00	12:00	13:00				14:00
Vol.	10	396	102	8	23	7		3	5	1				485



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/07/1														
8	0	19	4	0	1	0	0	0	0	0	0	0	0	24
01:00	0	8	1	0	0	0	0	0	0	0	0	0	0	9
02:00	0	6	3	0	0	0	0	0	0	0	0	0	0	9
03:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
04:00	0	3	5	0	0	0	0	0	0	0	0	0	0	8
05:00	0	21	5	0	1	0	0	0	1	0	0	0	0	28
06:00	0	43	15	0	1	0	0	0	0	0	0	0	0	59
07:00	0	111	29	0	9	1	0	0	0	0	0	0	0	150
08:00	0	221	33	4	5	0	0	0	0	0	0	0	0	263
09:00	0	260	52	3	5	0	0	0	0	0	0	0	0	320
10:00	0	292	60	3	6	0	0	0	1	0	0	0	0	362
11:00	0	281	65	3	11	0	0	0	0	0	0	0	0	360
12 PM	0	340	46	1	9	0	0	0	0	0	0	0	0	396
13:00	1	354	47	2	11	1	0	0	0	0	0	0	0	416
14:00	1	375	51	2	7	1	0	0	0	0	0	0	0	437
15:00	2	362	49	2	7	0	0	0	1	0	0	0	0	423
16:00	0	413	43	2	5	2	0	0	0	0	0	0	0	465
17:00	0	301	45	2	2	1	0	0	1	0	0	0	0	352
18:00	0	230	37	4	6	0	0	1	0	0	0	0	0	278
19:00	2	155	31	2	2	0	0	0	0	0	0	0	0	192
20:00	0	84	17	1	3	0	0	0	0	0	0	0	0	105
21:00	0	73	11	0	1	0	0	0	0	0	0	0	0	85
22:00	0	69	14	0	0	0	0	0	0	0	0	0	0	83
23:00	0	57	7	0	0	0	0	0	0	0	0	0	0	64
Total	6	4081	671	31	92	6	0	1	4	0	0	0	0	4892
Percent	0.1%	83.4%	13.7%	0.6%	1.9%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak		10:00	11:00	08:00	11:00	07:00			05:00					10:00
Vol.		292	65	4	11	1			1					362
PM Peak	15:00	16:00	14:00	18:00	13:00	16:00		18:00	15:00					16:00
Vol.	2	413	51	4	11	2		1	1					465



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/08/1														
8	0	15	3	0	0	0	0	0	0	0	0	0	0	18
01:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
02:00	0	9	0	0	0	0	0	0	0	0	0	0	0	9
03:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
04:00	0	2	2	0	0	0	0	0	0	0	0	0	0	4
05:00	0	8	3	0	0	0	0	0	0	0	0	0	0	11
06:00	0	36	7	0	0	0	0	0	0	0	0	0	0	43
07:00	0	85	19	0	5	0	0	0	0	0	0	0	0	109
08:00	0	159	26	0	5	1	0	0	1	0	0	0	0	192
09:00	1	219	43	0	1	1	0	0	1	0	0	0	0	266
10:00	0	261	40	1	3	0	0	1	0	0	0	0	0	306
11:00	0	288	37	1	9	0	0	0	0	0	0	0	0	335
12 PM	1	330	49	1	7	2	0	1	0	0	0	0	0	391
13:00	4	358	48	0	2	0	0	0	0	0	0	0	0	412
14:00	3	315	41	0	6	0	0	0	0	0	0	0	0	365
15:00	3	309	34	0	2	0	0	0	0	0	0	0	0	348
16:00	2	297	27	0	3	0	0	0	1	0	0	0	0	330
17:00	0	254	36	0	2	0	0	0	0	0	0	0	0	292
18:00	1	180	36	0	3	0	0	0	0	1	0	0	0	221
19:00	0	134	22	0	3	0	0	0	0	0	0	0	0	159
20:00	0	87	13	0	3	0	0	0	0	0	0	0	0	103
21:00	0	54	7	0	2	0	0	0	0	0	0	0	0	63
22:00	0	46	13	0	3	0	0	0	0	0	0	0	0	62
23:00	0	32	10	0	2	0	0	0	0	0	0	0	0	44
Total	15	3488	516	3	61	4	0	2	3	1	0	0	0	4093
Percent	0.4%	85.2%	12.6%	0.1%	1.5%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	11:00	09:00	10:00	11:00	08:00		10:00	08:00					11:00
Vol.	1	288	43	1	9	1		1	1					335
PM Peak	13:00	13:00	12:00	12:00	12:00	12:00		12:00	16:00	18:00				13:00
Vol.	4	358	49	1	7	2		1	1	1				412



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
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Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	16	6	0	0	0	0	0	1	0	0	0	0	23
01:00	0	9	0	0	0	0	0	0	0	0	0	0	0	9
02:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
03:00	0	2	0	0	1	0	0	0	0	0	0	0	0	3
04:00	0	22	8	0	0	1	0	0	0	0	0	0	0	31
05:00	0	110	21	1	5	1	0	0	2	0	0	0	0	140
06:00	1	412	88	6	18	4	1	2	1	0	0	0	0	533
07:00	1	690	108	13	16	7	2	2	2	0	0	0	0	841
08:00	13	724	86	5	15	14	1	0	2	0	0	0	0	860
09:00	0	522	88	6	21	3	2	1	0	0	0	0	0	643
10:00	0	281	80	4	16	1	0	0	4	0	0	0	0	386
11:00	2	272	70	8	18	3	1	2	4	0	0	0	0	380
12 PM	0	290	60	2	13	4	0	2	3	0	0	0	0	374
13:00	1	273	65	4	22	2	2	1	1	0	0	0	0	371
14:00	2	377	97	9	25	2	0	0	2	1	0	0	0	515
15:00	2	438	79	6	13	4	0	1	1	0	0	0	0	544
16:00	0	406	67	8	11	1	0	1	0	0	0	0	0	494
17:00	3	379	54	3	10	3	0	0	1	0	0	0	0	453
18:00	2	275	46	1	3	1	0	0	0	0	0	0	0	328
19:00	0	195	35	1	4	0	0	0	0	0	0	0	0	235
20:00	1	95	10	1	1	0	0	0	0	0	0	0	0	108
21:00	0	82	21	0	1	0	0	0	0	0	0	0	0	104
22:00	0	37	6	1	1	0	0	0	0	0	0	0	0	45
23:00	0	31	7	0	0	0	0	0	1	0	0	0	0	39
Total	28	5941	1103	79	214	51	9	12	25	1	0	0	0	7463
Percent	0.4%	79.6%	14.8%	1.1%	2.9%	0.7%	0.1%	0.2%	0.3%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	07:00	07:00	09:00	08:00	07:00	06:00	10:00					08:00
Vol.	13	724	108	13	21	14	2	2	4					860
PM Peak	17:00	15:00	14:00	14:00	14:00	12:00	13:00	12:00	12:00	14:00				15:00
Vol.	3	438	97	9	25	4	2	2	3	1				544



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3038-3076 Route 2A
east of Airport Road
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Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	11	3	0	3	0	0	0	0	0	0	0	0	17
01:00	0	6	0	0	1	0	0	0	1	0	0	0	0	8
02:00	0	5	3	0	0	0	0	0	0	0	0	0	0	8
03:00	0	2	1	1	0	0	0	0	0	0	0	0	0	4
04:00	0	23	9	1	1	0	0	1	0	0	0	0	0	35
05:00	1	123	26	0	4	1	1	1	0	0	0	0	0	157
06:00	3	397	97	2	14	3	2	0	4	0	0	0	0	522
07:00	8	801	114	5	19	5	3	2	2	1	0	0	0	960
08:00	3	688	114	5	20	6	1	1	3	0	0	0	0	841
09:00	2	570	98	8	21	7	2	2	4	0	0	0	0	714
10:00	0	302	81	9	10	3	1	2	4	0	0	0	0	412
11:00	0	305	70	11	19	3	0	2	2	0	0	0	0	412
12 PM	1	314	72	4	21	5	3	1	2	0	0	0	0	423
13:00	1	304	87	2	15	6	2	1	0	1	0	0	0	419
14:00	0	358	106	3	21	5	0	2	1	0	0	0	0	496
15:00	2	406	87	5	20	4	0	1	0	1	0	0	0	526
16:00	4	403	69	7	9	1	0	0	0	0	0	0	0	493
17:00	1	360	54	3	10	1	0	0	0	0	0	0	0	429
18:00	0	298	45	5	9	1	0	0	1	0	0	0	0	359
19:00	0	170	35	2	5	0	0	0	0	0	0	0	0	212
20:00	0	104	22	1	0	0	0	0	0	0	0	0	0	127
21:00	0	76	14	0	3	0	0	0	0	0	0	0	0	93
22:00	0	52	11	1	2	0	0	0	0	0	0	0	0	66
23:00	0	28	5	1	0	0	0	0	0	0	0	0	0	34
Total	26	6106	1223	76	227	51	15	16	24	3	0	0	0	7767
Percent	0.3%	78.6%	15.7%	1.0%	2.9%	0.7%	0.2%	0.2%	0.3%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	07:00	11:00	09:00	09:00	07:00	07:00	06:00	07:00				07:00
Vol.	8	801	114	11	21	7	3	2	4	1				960
PM Peak	16:00	15:00	14:00	16:00	12:00	13:00	12:00	14:00	12:00	13:00				15:00
Vol.	4	406	106	7	21	6	3	2	2	1				526



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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	10	1	0	0	0	0	0	0	0	0	0	0	11
01:00	0	30	4	0	0	0	0	0	0	0	0	0	0	34
02:00	0	14	5	0	0	0	0	0	0	0	0	0	0	19
03:00	0	5	0	2	0	0	0	0	0	0	0	0	0	7
04:00	0	21	7	1	0	0	0	0	0	0	0	0	0	29
05:00	0	106	22	1	6	1	0	0	0	0	0	0	0	136
06:00	1	391	83	5	21	2	0	1	1	1	0	0	0	506
07:00	12	745	123	7	24	5	1	4	6	0	0	0	0	927
08:00	12	726	92	2	10	11	0	3	0	0	0	0	0	856
09:00	10	605	82	7	23	8	3	2	2	0	0	0	0	742
10:00	2	313	74	6	16	2	0	0	3	0	0	0	0	416
11:00	0	311	79	4	16	1	1	4	3	0	0	0	0	419
12 PM	0	342	72	5	22	1	0	0	1	1	0	0	0	444
13:00	2	320	87	9	18	6	0	1	0	0	0	0	0	443
14:00	2	382	97	5	20	4	1	3	3	0	0	0	0	517
15:00	2	437	91	11	14	6	0	1	1	0	0	0	0	563
16:00	3	385	65	4	8	2	1	3	0	0	0	0	0	471
17:00	6	367	57	1	6	7	0	3	0	0	0	0	0	447
18:00	0	313	47	1	12	2	0	0	0	0	0	0	0	375
19:00	1	209	31	1	4	0	0	0	1	0	0	0	0	247
20:00	0	120	17	0	1	0	0	0	0	0	0	0	0	138
21:00	1	77	7	0	1	0	0	0	0	0	0	0	0	86
22:00	0	48	12	1	1	0	0	0	0	0	0	0	0	62
23:00	0	34	7	0	1	0	0	0	0	0	0	0	0	42
Total	54	6311	1162	73	224	58	7	25	21	2	0	0	0	7937
Percent	0.7%	79.5%	14.6%	0.9%	2.8%	0.7%	0.1%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	07:00	07:00	07:00	08:00	09:00	07:00	07:00	06:00				07:00
Vol.	12	745	123	7	24	11	3	4	6	1				927
PM Peak	17:00	15:00	14:00	15:00	12:00	17:00	14:00	14:00	14:00	12:00				15:00
Vol.	6	437	97	11	22	7	1	3	3	1				563



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3038-3076 Route 2A
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WB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	9	6	0	0	0	0	0	0	0	0	0	0	15
01:00	0	10	1	0	1	0	0	0	0	0	0	0	0	12
02:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
03:00	0	6	1	0	0	0	0	0	0	0	0	0	0	7
04:00	0	9	6	0	3	0	0	0	0	0	0	0	0	18
05:00	1	142	50	5	13	2	0	0	0	0	0	0	0	213
06:00	2	373	107	5	23	4	0	1	0	0	0	0	0	515
07:00	1	540	104	4	20	5	1	1	0	0	0	0	0	676
08:00	7	522	92	6	18	3	0	0	0	0	0	0	0	648
09:00	1	403	96	8	11	4	0	1	4	0	0	0	0	528
10:00	0	325	69	7	19	4	0	2	1	1	0	0	0	428
11:00	0	318	94	5	22	2	0	3	3	2	0	0	0	449
12 PM	1	367	84	4	16	1	2	1	1	0	0	0	0	477
13:00	2	328	83	7	22	0	0	1	0	0	0	0	0	443
14:00	4	456	100	7	12	3	0	1	0	0	0	0	0	583
15:00	1	704	156	7	28	2	0	2	0	0	0	0	0	900
16:00	4	876	142	3	22	1	0	0	0	0	0	0	0	1048
17:00	1	932	105	3	13	3	0	0	2	0	0	0	0	1059
18:00	1	586	64	3	5	0	0	1	0	0	0	0	0	660
19:00	0	308	49	2	5	0	0	0	0	0	0	0	0	364
20:00	0	196	18	0	4	1	0	0	0	0	0	0	0	219
21:00	0	151	16	1	0	0	0	0	0	0	0	0	0	168
22:00	0	68	14	0	0	0	0	0	0	0	0	0	0	82
23:00	0	40	4	0	1	0	0	0	0	0	0	0	0	45
Total	26	7675	1461	77	258	35	3	14	11	3	0	0	0	9563
Percent	0.3%	80.3%	15.3%	0.8%	2.7%	0.4%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	06:00	09:00	06:00	07:00	07:00	11:00	09:00	11:00				07:00
Vol.	7	540	107	8	23	5	1	3	4	2				676
PM Peak	14:00	17:00	15:00	13:00	15:00	14:00	12:00	15:00	17:00					17:00
Vol.	4	932	156	7	28	3	2	2	2					1059



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Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	16	2	1	1	0	0	0	0	0	0	0	0	20
01:00	0	10	1	0	1	0	0	1	0	0	0	0	0	13
02:00	0	7	3	0	0	1	0	0	0	0	0	0	0	11
03:00	0	7	1	0	0	0	0	0	0	0	0	0	0	8
04:00	0	10	5	1	2	1	0	0	0	0	0	0	0	19
05:00	0	118	45	6	11	1	0	1	0	0	0	0	0	182
06:00	2	307	106	8	22	3	1	1	0	0	0	0	0	450
07:00	3	481	105	9	22	3	0	3	1	0	0	0	0	627
08:00	1	540	98	9	20	3	0	0	1	0	0	0	0	672
09:00	1	351	87	6	18	1	0	4	1	0	0	0	0	469
10:00	1	266	89	2	20	3	0	0	6	2	0	0	0	389
11:00	2	323	73	9	17	1	1	5	2	1	0	0	0	434
12 PM	0	327	66	6	14	2	1	1	2	1	0	0	0	420
13:00	0	302	72	10	10	3	1	2	1	1	0	0	0	402
14:00	1	509	108	7	24	1	0	0	1	0	0	0	0	651
15:00	3	560	106	3	12	4	2	1	0	1	0	0	0	692
16:00	9	715	95	3	18	6	4	1	1	0	0	0	0	852
17:00	6	849	94	2	19	1	0	2	0	0	0	0	0	973
18:00	0	582	67	2	5	0	0	0	0	0	0	0	0	656
19:00	0	219	22	2	4	0	0	0	0	0	0	0	0	247
20:00	0	165	24	0	1	0	0	0	0	0	0	0	0	190
21:00	0	139	20	1	2	0	0	0	0	0	0	0	0	162
22:00	0	127	26	0	0	1	0	0	0	0	0	0	0	154
23:00	0	58	3	0	1	0	0	0	0	0	0	0	0	62
Total	29	6988	1318	87	244	35	10	22	16	6	0	0	0	8755
Percent	0.3%	79.8%	15.1%	1.0%	2.8%	0.4%	0.1%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	06:00	07:00	06:00	06:00	06:00	11:00	10:00	10:00				08:00
Vol.	3	540	106	9	22	3	1	5	6	2				672
PM Peak	16:00	17:00	14:00	13:00	14:00	16:00	16:00	13:00	12:00	12:00				17:00
Vol.	9	849	108	10	24	6	4	2	2	1				973



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04/07/1														
8	0	24	4	0	1	0	0	0	0	0	0	0	0	29
01:00	0	14	1	0	1	0	0	0	0	0	0	0	0	16
02:00	0	14	1	0	2	1	0	0	0	0	0	0	0	18
03:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
04:00	0	7	2	0	0	0	0	0	0	1	0	0	0	10
05:00	0	27	5	0	3	0	0	0	0	0	0	0	0	35
06:00	0	74	30	0	3	1	0	0	0	0	0	0	0	108
07:00	1	114	34	1	7	1	0	0	2	0	0	0	0	160
08:00	1	167	38	4	8	1	0	0	0	0	0	0	0	219
09:00	3	222	39	2	5	0	0	0	0	0	0	0	0	271
10:00	0	290	51	4	8	2	0	0	0	0	0	0	0	355
11:00	1	321	53	2	10	0	0	1	1	0	0	0	0	389
12 PM	1	355	54	2	3	0	0	0	1	0	0	0	0	416
13:00	1	425	54	2	7	0	0	0	0	0	0	0	0	489
14:00	2	427	65	3	6	0	0	0	0	0	0	0	0	503
15:00	1	362	37	3	8	0	0	0	0	0	0	0	0	411
16:00	1	319	55	2	6	1	0	0	0	0	0	0	0	384
17:00	2	261	45	3	3	1	0	0	0	0	0	0	0	315
18:00	1	242	29	2	8	0	0	0	0	0	0	0	0	282
19:00	0	207	30	2	2	0	0	0	0	0	0	0	0	241
20:00	0	139	24	2	3	0	0	0	0	0	0	0	0	168
21:00	0	141	17	0	1	0	0	0	0	0	0	0	0	159
22:00	0	131	13	0	0	0	0	0	0	0	0	0	0	144
23:00	0	66	9	0	1	0	0	0	0	0	0	0	0	76
Total	15	4353	691	34	96	8	0	1	4	1	0	0	0	5203
Percent	0.3%	83.7%	13.3%	0.7%	1.8%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	11:00	11:00	08:00	11:00	10:00		11:00	07:00	04:00				11:00
Vol.	3	321	53	4	10	2		1	2	1				389
PM Peak	14:00	14:00	14:00	14:00	15:00	16:00			12:00					14:00
Vol.	2	427	65	3	8	1			1					503



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/08/1														
8	0	33	5	0	0	0	0	0	0	0	0	0	0	38
01:00	0	24	2	0	0	0	0	0	0	0	0	0	0	26
02:00	0	14	2	0	0	0	0	0	0	0	0	0	0	16
03:00	0	9	1	0	0	0	0	0	0	0	0	0	0	10
04:00	0	9	3	0	1	0	0	0	0	0	0	0	0	13
05:00	0	17	3	0	0	0	0	0	0	0	0	0	0	20
06:00	0	62	17	0	3	0	0	0	1	0	0	0	0	83
07:00	0	73	15	0	3	0	0	0	1	0	0	0	0	92
08:00	0	123	21	2	0	0	0	0	0	0	0	0	0	146
09:00	1	180	23	0	5	0	0	0	0	0	0	0	0	209
10:00	0	253	48	0	8	0	0	0	0	1	0	0	0	310
11:00	0	261	50	1	4	0	0	0	0	0	0	0	0	316
12 PM	3	390	53	0	4	0	0	0	0	0	0	0	0	450
13:00	0	398	48	0	3	0	0	0	0	0	0	0	0	449
14:00	3	347	56	1	6	0	0	0	0	0	0	0	0	413
15:00	0	347	51	0	4	0	0	1	1	0	0	0	0	404
16:00	1	285	49	0	2	1	0	0	0	0	0	0	0	338
17:00	0	235	34	1	2	0	0	0	0	0	0	0	0	272
18:00	0	245	26	0	2	0	0	0	0	0	0	0	0	273
19:00	1	150	13	0	2	1	0	0	0	0	0	0	0	167
20:00	1	121	18	0	3	0	0	0	0	0	0	0	0	143
21:00	0	71	12	0	1	0	0	0	0	0	0	0	0	84
22:00	0	40	12	0	1	0	0	0	0	0	0	0	0	53
23:00	0	15	5	0	0	0	0	0	0	0	0	0	0	20
Total	10	3702	567	5	54	2	0	1	3	1	0	0	0	4345
Percent	0.2%	85.2%	13.0%	0.1%	1.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	11:00	11:00	08:00	10:00				06:00	10:00				11:00
Vol.	1	261	50	2	8				1	1				316
PM Peak	12:00	13:00	14:00	14:00	14:00	16:00		15:00	15:00					12:00
Vol.	3	398	56	1	6	1		1	1					450



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3038-3076 Route 2A
east of Airport Road
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Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	9	3	0	0	0	0	0	0	0	0	0	0	12
01:00	0	7	0	0	1	0	0	0	0	0	0	0	0	8
02:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
03:00	0	2	1	0	1	0	0	0	0	0	0	0	0	4
04:00	0	21	5	0	0	2	0	0	0	0	0	0	0	28
05:00	1	146	57	9	9	1	0	2	0	0	0	0	0	225
06:00	2	371	96	7	14	0	0	4	1	0	0	0	0	495
07:00	3	504	99	7	20	3	0	3	0	0	0	0	0	639
08:00	11	471	85	5	17	4	0	0	0	0	0	0	0	593
09:00	2	409	93	4	27	8	1	0	1	0	0	0	0	545
10:00	1	284	71	9	10	1	0	3	4	0	0	0	0	383
11:00	1	273	67	2	26	4	0	1	4	0	0	0	0	378
12 PM	2	334	79	5	20	5	0	3	3	0	0	0	0	451
13:00	1	287	70	6	27	5	2	3	4	0	0	0	0	405
14:00	0	386	88	3	17	3	0	2	0	0	0	0	0	499
15:00	4	577	143	2	33	3	0	4	2	0	0	0	0	768
16:00	1	770	121	8	22	0	0	2	1	0	0	0	0	925
17:00	0	856	87	3	18	0	0	1	0	0	0	0	0	965
18:00	0	542	77	2	6	0	0	1	0	0	0	0	0	628
19:00	0	255	42	3	7	0	0	0	0	0	0	0	0	307
20:00	0	183	23	0	2	0	0	0	0	0	0	0	0	208
21:00	0	129	17	0	0	0	0	0	1	0	0	0	0	147
22:00	0	56	8	1	1	0	0	0	0	0	0	0	0	66
23:00	0	40	4	0	1	0	0	0	0	0	0	0	0	45
Total	29	6914	1337	76	279	39	3	29	21	0	0	0	0	8727
Percent	0.3%	79.2%	15.3%	0.9%	3.2%	0.4%	0.0%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	07:00	05:00	09:00	09:00	09:00	06:00	10:00					07:00
Vol.	11	504	99	9	27	8	1	4	4					639
PM Peak	15:00	17:00	15:00	16:00	15:00	12:00	13:00	15:00	13:00					17:00
Vol.	4	856	143	8	33	5	2	4	4					965



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3038-3076 Route 2A
east of Airport Road
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WB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	9	3	0	0	0	0	0	0	0	0	0	0	12
01:00	0	5	0	0	1	0	0	0	0	0	0	0	0	6
02:00	1	3	0	1	1	1	0	0	0	0	0	0	0	7
03:00	0	2	2	0	0	0	0	0	0	0	0	0	0	4
04:00	0	13	9	1	0	0	1	0	0	1	0	0	0	25
05:00	2	144	54	9	10	3	0	0	0	0	0	0	0	222
06:00	0	379	106	6	22	2	1	1	5	0	0	0	0	522
07:00	3	554	93	6	16	3	0	3	1	0	0	0	0	679
08:00	4	530	108	5	27	6	0	2	2	0	0	0	0	684
09:00	3	438	108	10	23	7	0	2	3	0	0	0	0	594
10:00	1	290	72	5	18	2	1	4	1	2	0	0	0	396
11:00	0	254	74	5	15	4	1	1	4	0	0	0	0	358
12 PM	1	369	79	3	14	5	0	2	3	0	0	0	0	476
13:00	2	300	85	6	17	5	0	1	2	0	0	0	0	418
14:00	0	403	103	11	22	5	0	7	1	0	0	0	0	552
15:00	0	686	140	7	26	2	0	1	0	0	0	0	0	862
16:00	3	870	139	3	14	4	0	2	1	0	0	0	0	1036
17:00	2	844	106	3	13	5	0	0	0	1	0	0	0	974
18:00	0	602	74	3	3	1	0	0	0	1	0	0	0	684
19:00	0	273	33	4	6	0	0	0	0	0	0	0	0	316
20:00	0	157	24	0	1	0	0	0	0	0	0	0	0	182
21:00	0	153	23	0	3	0	0	0	0	1	0	0	0	180
22:00	0	64	10	2	2	0	0	0	0	0	0	0	0	78
23:00	0	36	7	0	1	0	0	0	0	0	0	0	0	44
Total	22	7378	1452	90	255	55	4	26	23	6	0	0	0	9311
Percent	0.2%	79.2%	15.6%	1.0%	2.7%	0.6%	0.0%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	08:00	09:00	08:00	09:00	04:00	10:00	06:00	10:00				08:00
Vol.	4	554	108	10	27	7	1	4	5	2				684
PM Peak	16:00	16:00	15:00	14:00	15:00	12:00		14:00	12:00	17:00				16:00
Vol.	3	870	140	11	26	5		7	3	1				1036



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3038-3076 Route 2A
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WB

176038 A Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	18	3	0	1	0	0	0	0	0	0	0	0	22
01:00	0	6	1	0	0	0	0	0	0	0	0	0	0	7
02:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
03:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
04:00	0	13	7	2	0	1	0	0	0	0	0	0	0	23
05:00	1	129	53	9	15	3	0	0	0	1	0	0	0	211
06:00	1	362	115	8	19	2	1	2	1	0	0	0	0	511
07:00	6	510	98	5	19	2	0	2	1	0	0	0	0	643
08:00	9	476	101	7	17	1	0	0	4	0	0	0	0	615
09:00	5	425	95	8	28	5	1	4	0	0	0	0	0	571
10:00	1	306	79	6	12	2	0	1	3	0	0	0	0	410
11:00	0	331	81	6	19	4	1	2	2	0	0	0	0	446
12 PM	1	368	61	7	25	4	0	3	0	0	0	0	0	469
13:00	0	343	92	6	14	1	0	3	3	0	0	0	0	462
14:00	0	422	113	5	10	3	0	5	0	0	0	0	0	558
15:00	1	653	131	3	28	2	0	5	1	0	0	0	0	824
16:00	3	854	134	2	15	4	1	1	0	0	0	0	0	1014
17:00	5	810	106	2	15	2	3	1	1	0	0	0	0	945
18:00	1	580	63	2	12	0	0	0	0	0	0	0	0	658
19:00	0	307	29	1	4	0	0	0	0	0	0	0	0	341
20:00	0	198	26	0	3	0	0	0	0	0	0	0	0	227
21:00	0	149	17	0	0	0	0	0	0	0	0	0	0	166
22:00	0	81	3	1	2	0	0	0	1	1	0	0	0	89
23:00	1	52	7	0	1	0	0	0	0	0	0	0	0	61
Total	35	7403	1415	80	259	36	7	29	17	2	0	0	0	9283
Percent	0.4%	79.7%	15.2%	0.9%	2.8%	0.4%	0.1%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	06:00	05:00	09:00	09:00	06:00	09:00	08:00	05:00				07:00
Vol.	9	510	115	9	28	5	1	4	4	1				643
PM Peak	17:00	16:00	16:00	12:00	15:00	12:00	17:00	14:00	13:00	22:00				16:00
Vol.	5	854	134	7	28	4	3	5	3	1				1014



PRECISION
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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	0	0	2	2	1	2	0	0	0	0	7	51	44
01:00	0	0	0	0	0	4	14	16	12	2	0	0	0	48	51	46
02:00	0	0	0	0	1	1	3	3	0	0	0	0	0	8	47	42
03:00	0	0	0	0	0	1	4	2	0	0	0	0	0	7	46	43
04:00	0	0	0	0	2	2	11	10	2	0	0	0	0	27	47	43
05:00	0	0	0	0	8	21	60	59	9	0	0	0	0	157	47	43
06:00	0	0	1	5	25	155	235	62	7	0	0	0	0	490	43	40
07:00	5	7	12	28	98	366	307	43	2	1	1	0	0	870	42	38
08:00	79	48	60	77	112	234	217	46	2	0	0	0	0	875	42	32
09:00	0	1	4	10	98	322	357	47	1	0	0	0	0	840	42	39
10:00	1	0	0	0	22	190	201	39	0	0	0	0	0	453	43	40
11:00	0	0	1	3	27	144	184	55	2	0	0	0	0	416	43	40
12 PM	0	0	0	4	23	156	215	48	5	0	0	0	0	451	43	40
13:00	0	0	0	6	38	114	206	52	3	0	0	0	0	419	43	40
14:00	1	0	1	1	34	196	219	76	8	0	0	0	0	536	44	40
15:00	2	1	1	6	52	183	247	78	1	1	0	0	0	572	43	40
16:00	1	0	3	1	30	149	211	74	10	0	0	0	0	479	44	41
17:00	0	0	5	8	36	164	220	47	3	1	0	0	0	484	43	40
18:00	0	0	0	3	18	95	146	73	8	0	0	0	0	343	46	41
19:00	0	0	0	0	4	72	118	34	6	0	1	0	0	235	44	41
20:00	0	0	0	0	5	35	64	24	4	0	0	0	0	132	45	42
21:00	0	0	0	0	4	30	50	24	6	0	0	0	0	114	46	42
22:00	0	0	0	0	5	14	25	18	3	1	0	0	0	66	47	42
23:00	0	0	0	0	1	12	13	11	4	1	0	0	0	42	48	43
Total %	89 1.1%	57 0.7%	88 1.1%	152 1.9%	643 8.0%	2662 33.0%	3329 41.2%	942 11.7%	100 1.2%	7 0.1%	2 0.0%	0 0.0%	0 0.0%	8071		
AM Peak	08:00	08:00	08:00	08:00	08:00	07:00	09:00	06:00	01:00	01:00	07:00			08:00		
Vol.	79	48	60	77	112	366	357	62	12	2	1			875		
PM Peak	15:00	15:00	17:00	17:00	15:00	14:00	15:00	15:00	16:00	15:00	19:00			15:00		
Vol.	2	1	5	8	52	196	247	78	10	1	1			572		

Stats

15th Percentile :	34 MPH
50th Percentile :	39 MPH
85th Percentile :	43 MPH
95th Percentile :	47 MPH
Mean Speed(Average) :	39 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	5991
Percent in Pace :	74.2%
Number of Vehicles > 40 MPH :	3714
Percent of Vehicles > 40 MPH :	46.0%



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EB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	0	1	1	4	2	0	1	0	0	0	9	48	43
01:00	0	0	0	0	0	1	3	1	1	0	0	0	0	6	49	44
02:00	0	0	1	0	1	4	10	8	22	3	0	0	0	49	53	47
03:00	0	0	0	0	0	2	2	8	0	1	0	1	0	14	48	47
04:00	0	0	0	0	0	6	7	8	3	1	0	0	0	25	49	44
05:00	0	0	0	0	0	18	51	43	10	2	0	0	0	124	48	44
06:00	1	2	3	3	21	113	173	99	7	2	0	0	0	424	46	41
07:00	1	0	3	9	73	228	312	80	4	0	1	0	0	711	43	40
08:00	2	4	10	26	65	319	327	44	3	0	0	0	0	800	42	39
09:00	5	6	10	11	27	202	258	58	1	0	0	1	0	579	43	39
10:00	0	0	0	3	32	157	170	56	2	0	0	0	0	420	43	40
11:00	0	0	1	6	45	154	184	50	4	0	0	0	0	444	43	40
12 PM	0	0	1	9	29	97	183	70	1	0	0	0	0	390	44	41
13:00	0	0	2	8	39	140	179	57	5	1	0	0	0	431	43	40
14:00	0	2	2	7	90	157	198	23	4	2	0	0	0	485	42	39
15:00	3	0	63	44	68	164	121	11	0	0	0	0	0	474	41	35
16:00	9	3	123	16	57	91	54	12	0	0	0	0	0	365	40	31
17:00	4	0	69	14	34	90	119	24	2	1	0	0	0	357	42	35
18:00	0	0	0	0	5	89	158	55	6	1	0	0	0	314	45	42
19:00	0	0	0	1	16	69	102	36	5	2	1	0	0	232	45	41
20:00	0	0	1	0	6	49	70	15	5	1	0	0	0	147	43	41
21:00	0	0	0	0	7	31	46	11	1	0	0	0	0	96	43	40
22:00	0	0	0	0	18	28	24	12	2	1	1	0	0	86	45	40
23:00	0	0	1	1	3	19	27	16	3	0	0	0	0	70	46	41
Total %	25 0.4%	17 0.2%	290 4.1%	158 2.2%	637 9.0%	2229 31.6%	2782 39.4%	799 11.3%	91 1.3%	19 0.3%	3 0.0%	2 0.0%	0 0.0%	7052		
AM Peak	09:00	09:00	08:00	08:00	07:00	08:00	08:00	06:00	02:00	02:00	07:00	03:00		08:00		
Vol.	5	6	10	26	73	319	327	99	22	3	1	1		800		
PM Peak	16:00	16:00	16:00	15:00	14:00	15:00	14:00	12:00	18:00	14:00	19:00			14:00		
Vol.	9	3	123	44	90	164	198	70	6	2	1			485		

Stats

15th Percentile :	33 MPH
50th Percentile :	39 MPH
85th Percentile :	43 MPH
95th Percentile :	47 MPH
Mean Speed(Average) :	39 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	5011
Percent in Pace :	71.1%
Number of Vehicles > 40 MPH :	3140
Percent of Vehicles > 40 MPH :	44.5%



PRECISION
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Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/																
18	0	0	0	0	3	6	9	6	0	0	0	0	0	24	46	41
01:00	0	0	0	0	0	4	3	2	0	0	0	0	0	9	45	41
02:00	0	0	0	0	1	3	2	1	2	0	0	0	0	9	50	42
03:00	0	0	0	0	0	1	2	1	0	0	0	0	0	4	46	42
04:00	0	0	0	0	0	0	4	4	0	0	0	0	0	8	47	45
05:00	0	0	0	0	0	8	13	5	2	0	0	0	0	28	46	42
06:00	0	0	0	0	1	9	26	14	6	3	0	0	0	59	49	44
07:00	0	0	0	0	3	21	76	44	4	2	0	0	0	150	47	43
08:00	0	0	0	0	11	58	141	47	5	1	0	0	0	263	45	42
09:00	0	0	0	0	7	90	163	55	5	0	0	0	0	320	45	41
10:00	0	0	0	1	16	123	159	57	4	2	0	0	0	362	44	41
11:00	0	0	0	4	28	141	145	38	4	0	0	0	0	360	43	40
12 PM	0	0	0	1	22	130	186	51	6	0	0	0	0	396	43	41
13:00	0	0	0	2	28	126	207	51	2	0	0	0	0	416	43	40
14:00	0	0	0	1	27	143	199	63	4	0	0	0	0	437	44	41
15:00	0	0	0	1	23	177	189	30	3	0	0	0	0	423	43	40
16:00	0	0	0	7	65	147	211	35	0	0	0	0	0	465	43	39
17:00	0	0	0	8	20	118	166	39	1	0	0	0	0	352	43	40
18:00	0	0	0	1	10	84	124	55	4	0	0	0	0	278	45	41
19:00	0	0	0	0	4	44	103	39	2	0	0	0	0	192	45	42
20:00	0	0	0	1	5	18	45	27	9	0	0	0	0	105	47	43
21:00	0	0	0	2	4	17	40	17	5	0	0	0	0	85	46	42
22:00	0	0	0	0	4	18	41	15	4	1	0	0	0	83	46	42
23:00	0	0	0	0	1	12	25	17	8	1	0	0	0	64	48	44
Total	0	0	0	29	283	1498	2279	713	80	10	0	0	0	4892		
%	0.0%	0.0%	0.0%	0.6%	5.8%	30.6%	46.6%	14.6%	1.6%	0.2%	0.0%	0.0%	0.0%			
AM Peak				11:00	11:00	11:00	09:00	10:00	06:00	06:00				10:00		
Vol.				4	28	141	163	57	6	3				362		
PM Peak				17:00	16:00	15:00	16:00	14:00	20:00	22:00				16:00		
Vol.				8	65	177	211	63	9	1				465		

Stats

15th Percentile :	35 MPH
50th Percentile :	40 MPH
85th Percentile :	44 MPH
95th Percentile :	47 MPH
Mean Speed(Average) :	41 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	3777
Percent in Pace :	77.2%
Number of Vehicles > 40 MPH :	2626
Percent of Vehicles > 40 MPH :	53.7%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	0	3	5	7	3	0	0	0	0	18	49	45
01:00	0	0	0	1	1	0	2	1	1	0	0	0	0	6	49	40
02:00	0	0	0	0	0	0	3	5	0	1	0	0	0	9	48	46
03:00	0	0	0	0	0	0	1	1	2	0	0	0	0	4	52	48
04:00	0	0	0	0	0	0	1	3	0	0	0	0	0	4	48	46
05:00	0	0	0	0	1	0	5	3	1	1	0	0	0	11	50	45
06:00	0	0	0	0	2	6	17	15	2	1	0	0	0	43	47	43
07:00	0	0	0	0	3	11	41	47	6	1	0	0	0	109	48	44
08:00	0	0	0	0	3	30	94	59	5	1	0	0	0	192	47	43
09:00	0	0	0	0	5	69	135	48	9	0	0	0	0	266	45	42
10:00	0	0	3	1	8	81	171	40	2	0	0	0	0	306	43	41
11:00	0	0	0	2	12	122	159	38	2	0	0	0	0	335	43	40
12 PM	0	0	0	3	29	159	160	37	3	0	0	0	0	391	43	40
13:00	2	0	0	1	24	167	154	58	6	0	0	0	0	412	44	40
14:00	0	0	0	0	15	152	158	36	4	0	0	0	0	365	43	40
15:00	0	0	0	0	33	147	125	38	5	0	0	0	0	348	43	40
16:00	0	0	0	1	21	94	160	49	5	0	0	0	0	330	44	41
17:00	0	0	0	1	16	82	134	56	3	0	0	0	0	292	45	41
18:00	0	0	0	0	4	62	100	50	5	0	0	0	0	221	46	42
19:00	0	0	0	0	5	47	78	25	4	0	0	0	0	159	45	41
20:00	0	0	0	0	2	19	59	17	6	0	0	0	0	103	46	42
21:00	0	0	0	0	0	16	30	13	3	1	0	0	0	63	46	42
22:00	0	0	0	0	3	14	22	18	4	1	0	0	0	62	47	43
23:00	0	0	0	0	0	3	19	16	6	0	0	0	0	44	48	45
Total	2	0	3	10	187	1284	1833	680	87	7	0	0	0	4093		
%	0.0%	0.0%	0.1%	0.2%	4.6%	31.4%	44.8%	16.6%	2.1%	0.2%	0.0%	0.0%	0.0%			
AM Peak			10:00	11:00	11:00	11:00	10:00	08:00	09:00	02:00				11:00		
Vol.			3	2	12	122	171	59	9	1				335		
PM Peak	13:00			12:00	15:00	13:00	12:00	13:00	13:00	21:00				13:00		
Vol.	2			3	33	167	160	58	6	1				412		

Stats

15th Percentile :	35 MPH
50th Percentile :	40 MPH
85th Percentile :	45 MPH
95th Percentile :	48 MPH
Mean Speed(Average) :	41 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	3117
Percent in Pace :	76.2%
Number of Vehicles > 40 MPH :	2240
Percent of Vehicles > 40 MPH :	54.7%



PRECISION
D A T A
INDUSTRIES, LLC

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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	0	6	12	5	0	0	0	0	0	23	45	42
01:00	0	0	0	0	0	4	3	2	0	0	0	0	0	9	45	41
02:00	0	0	0	0	0	0	3	1	0	0	0	0	0	4	46	43
03:00	0	0	0	0	0	0	1	2	0	0	0	0	0	3	47	45
04:00	0	0	0	0	0	4	15	7	3	2	0	0	0	31	49	44
05:00	0	0	0	0	4	22	66	41	7	0	0	0	0	140	47	43
06:00	0	0	0	2	23	162	265	75	6	0	0	0	0	533	44	41
07:00	9	6	11	28	46	328	361	50	1	0	1	0	0	841	42	39
08:00	182	80	121	80	78	186	113	19	1	0	0	0	0	860	39	26
09:00	23	29	28	18	52	266	199	26	2	0	0	0	0	643	42	36
10:00	0	0	0	2	33	136	161	49	5	0	0	0	0	386	43	40
11:00	0	0	4	2	16	133	178	45	1	0	0	0	1	380	43	40
12 PM	0	0	0	4	30	116	180	40	4	0	0	0	0	374	43	40
13:00	0	0	2	6	56	146	132	28	1	0	0	0	0	371	42	39
14:00	0	0	1	4	40	194	226	45	4	1	0	0	0	515	43	40
15:00	0	0	1	1	29	118	294	91	10	0	0	0	0	544	45	41
16:00	0	0	0	2	27	149	216	89	9	1	0	1	0	494	45	41
17:00	0	2	3	9	29	161	194	51	3	0	0	0	1	453	43	40
18:00	0	0	0	0	11	87	168	58	4	0	0	0	0	328	45	41
19:00	0	0	0	1	5	75	96	51	7	0	0	0	0	235	46	42
20:00	0	0	0	0	9	28	35	33	3	0	0	0	0	108	46	42
21:00	0	0	0	0	4	15	50	30	4	1	0	0	0	104	47	43
22:00	0	0	0	0	3	9	15	13	4	1	0	0	0	45	48	43
23:00	0	0	0	0	0	10	11	10	8	0	0	0	0	39	50	44
Total	214	117	171	159	495	2355	2994	861	87	6	1	1	2	7463		
%	2.9%	1.6%	2.3%	2.1%	6.6%	31.6%	40.1%	11.5%	1.2%	0.1%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	08:00	08:00	07:00	07:00	06:00	05:00	04:00	07:00		11:00	08:00		
Vol.	182	80	121	80	78	328	361	75	7	2	1		1	860		
PM Peak		17:00	17:00	17:00	13:00	14:00	15:00	15:00	15:00	14:00		16:00	17:00	15:00		
Vol.		2	3	9	56	194	294	91	10	1		1	1	544		

Stats

15th Percentile : 33 MPH
50th Percentile : 39 MPH
85th Percentile : 43 MPH
95th Percentile : 47 MPH

Mean Speed(Average) : 38 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 5349
Percent in Pace : 71.7%
Number of Vehicles > 40 MPH : 3353
Percent of Vehicles > 40 MPH : 44.9%



PRECISION
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INDUSTRIES, LLC

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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
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EB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	0	0	5	5	6	1	0	0	0	0	17	47	43
01:00	0	0	0	0	2	2	0	3	1	0	0	0	0	8	48	41
02:00	0	0	0	0	0	4	0	3	1	0	0	0	0	8	48	43
03:00	0	0	0	0	0	0	4	0	0	0	0	0	0	4	43	42
04:00	0	0	0	0	0	11	13	7	3	1	0	0	0	35	48	43
05:00	0	0	0	2	2	26	68	47	12	0	0	0	0	157	47	43
06:00	2	3	1	4	18	142	285	64	3	0	0	0	0	522	43	41
07:00	10	14	21	32	109	470	280	22	1	0	0	0	1	960	41	37
08:00	0	0	11	33	186	364	223	23	1	0	0	0	0	841	41	37
09:00	2	5	6	28	87	334	224	22	5	0	0	0	1	714	42	38
10:00	0	0	0	1	28	148	188	42	4	0	0	0	1	412	43	40
11:00	1	0	2	6	36	155	162	49	1	0	0	0	0	412	43	39
12 PM	0	0	0	8	25	181	165	40	3	1	0	0	0	423	43	40
13:00	0	0	0	9	28	148	168	59	7	0	0	0	0	419	44	40
14:00	0	0	2	9	51	174	208	49	2	0	0	1	0	496	43	39
15:00	0	0	1	15	46	187	225	48	4	0	0	0	0	526	43	39
16:00	0	1	11	11	55	187	176	50	2	0	0	0	0	493	43	39
17:00	3	4	7	6	24	156	182	43	4	0	0	0	0	429	43	39
18:00	0	0	0	3	17	100	188	47	4	0	0	0	0	359	43	41
19:00	0	0	0	2	13	63	92	41	1	0	0	0	0	212	45	41
20:00	0	0	0	0	6	24	64	27	6	0	0	0	0	127	46	42
21:00	0	0	0	0	2	29	42	18	2	0	0	0	0	93	45	41
22:00	1	0	0	0	4	15	26	17	2	1	0	0	0	66	46	42
23:00	0	0	0	0	1	2	14	12	5	0	0	0	0	34	48	45
Total	19	27	62	169	740	2927	3002	739	75	3	0	1	3	7767		
%	0.2%	0.3%	0.8%	2.2%	9.5%	37.7%	38.7%	9.5%	1.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	07:00	07:00	08:00	08:00	07:00	06:00	06:00	05:00	04:00			07:00	07:00		
Vol.	10	14	21	33	186	470	285	64	12	1			1	960		
PM Peak	17:00	17:00	16:00	15:00	16:00	15:00	15:00	13:00	13:00	12:00		14:00		15:00		
Vol.	3	4	11	15	55	187	225	59	7	1		1		526		

Stats

15th Percentile :	34 MPH
50th Percentile :	38 MPH
85th Percentile :	43 MPH
95th Percentile :	46 MPH
Mean Speed(Average) :	39 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	5929
Percent in Pace :	76.3%
Number of Vehicles > 40 MPH :	3223
Percent of Vehicles > 40 MPH :	41.5%



PRECISION
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INDUSTRIES, LLC

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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/																
18	0	0	0	0	1	3	5	2	0	0	0	0	0	11	44	41
01:00	0	0	0	0	0	4	0	11	14	5	0	0	0	34	53	49
02:00	0	0	0	0	1	2	4	11	1	0	0	0	0	19	48	44
03:00	0	0	0	0	0	3	2	2	0	0	0	0	0	7	46	41
04:00	0	0	0	0	1	6	6	12	2	1	1	0	0	29	48	45
05:00	0	0	0	0	3	23	55	45	9	0	1	0	0	136	47	43
06:00	0	0	0	0	27	137	243	88	11	0	0	0	0	506	45	41
07:00	59	53	72	52	89	338	236	28	0	0	0	0	0	927	41	33
08:00	170	107	147	128	111	153	40	0	0	0	0	0	0	856	36	24
09:00	63	51	70	47	100	200	184	25	2	0	0	0	0	742	41	32
10:00	0	1	0	2	27	162	186	35	3	0	0	0	0	416	43	40
11:00	0	0	1	10	56	136	175	34	5	1	0	0	1	419	43	39
12 PM	0	2	0	2	24	181	193	41	1	0	0	0	0	444	43	40
13:00	0	0	0	0	27	186	181	47	2	0	0	0	0	443	43	40
14:00	0	0	3	6	40	203	210	48	7	0	0	0	0	517	43	40
15:00	0	0	0	12	61	193	239	53	5	0	0	0	0	563	43	39
16:00	2	0	25	27	69	154	156	34	4	0	0	0	0	471	42	37
17:00	5	0	48	10	56	136	165	25	2	0	0	0	0	447	42	37
18:00	0	0	2	1	17	111	177	58	9	0	0	0	0	375	44	41
19:00	0	0	0	1	19	64	101	55	6	1	0	0	0	247	46	41
20:00	0	0	0	0	4	34	65	27	7	1	0	0	0	138	46	42
21:00	0	0	0	0	4	34	32	12	2	2	0	0	0	86	45	41
22:00	0	0	0	0	1	13	30	11	5	2	0	0	0	62	47	43
23:00	0	0	0	1	3	2	15	11	7	3	0	0	0	42	51	45
Total	299	214	368	299	741	2478	2700	715	104	16	2	0	1	7937		
%	3.8%	2.7%	4.6%	3.8%	9.3%	31.2%	34.0%	9.0%	1.3%	0.2%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	08:00	08:00	07:00	06:00	06:00	01:00	01:00	04:00		11:00	07:00		
Vol.	170	107	147	128	111	338	243	88	14	5	1		1	927		
PM Peak	17:00	12:00	17:00	16:00	16:00	14:00	15:00	18:00	18:00	23:00				15:00		
Vol.	5	2	48	27	69	203	239	58	9	3				563		

Stats

15th Percentile : 29 MPH
50th Percentile : 38 MPH
85th Percentile : 43 MPH
95th Percentile : 47 MPH

Mean Speed(Average) : 37 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 5178
Percent in Pace : 65.2%
Number of Vehicles > 40 MPH : 2998
Percent of Vehicles > 40 MPH : 37.8%



PRECISION
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3038-3076 Route 2A
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Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	0	3	6	6	0	0	0	0	0	0	15	42	38
01:00	0	0	0	0	3	5	4	0	0	0	0	0	0	12	41	37
02:00	0	0	0	0	0	2	2	2	0	0	0	0	0	6	46	42
03:00	0	0	0	0	0	2	4	0	1	0	0	0	0	7	43	42
04:00	0	0	0	0	3	1	8	5	1	0	0	0	0	18	47	42
05:00	0	0	0	0	13	77	105	17	1	0	0	0	0	213	43	40
06:00	0	1	6	19	81	246	152	10	0	0	0	0	0	515	41	37
07:00	0	0	2	9	141	358	151	14	1	0	0	0	0	676	41	37
08:00	4	1	21	24	105	333	146	13	1	0	0	0	0	648	41	36
09:00	0	0	0	3	113	254	147	10	1	0	0	0	0	528	41	37
10:00	0	0	0	7	75	199	122	24	1	0	0	0	0	428	42	38
11:00	0	0	0	5	72	231	120	18	3	0	0	0	0	449	42	38
12 PM	1	0	0	11	74	227	147	16	1	0	0	0	0	477	42	38
13:00	0	0	2	7	68	199	140	25	2	0	0	0	0	443	42	38
14:00	2	2	1	21	125	273	143	15	1	0	0	0	0	583	41	37
15:00	0	0	0	49	216	449	167	18	1	0	0	0	0	900	40	36
16:00	6	26	65	77	199	487	166	22	0	0	0	0	0	1048	39	35
17:00	6	8	49	114	357	404	117	3	1	0	0	0	0	1059	38	34
18:00	0	1	5	12	158	343	132	9	0	0	0	0	0	660	40	37
19:00	0	0	2	7	49	177	118	9	2	0	0	0	0	364	42	38
20:00	0	0	0	2	26	100	73	18	0	0	0	0	0	219	42	39
21:00	0	0	0	0	24	74	62	8	0	0	0	0	0	168	42	39
22:00	0	0	0	0	6	32	31	11	2	0	0	0	0	82	44	40
23:00	0	0	0	0	8	17	19	1	0	0	0	0	0	45	42	38
Total	19	39	153	367	1919	4496	2282	268	20	0	0	0	0	9563		
%	0.2%	0.4%	1.6%	3.8%	20.1%	47.0%	23.9%	2.8%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	06:00	08:00	08:00	07:00	07:00	06:00	10:00	11:00					07:00		
Vol.	4	1	21	24	141	358	152	24	3					676		
PM Peak	16:00	16:00	16:00	17:00	17:00	16:00	15:00	13:00	13:00					17:00		
Vol.	6	26	65	114	357	487	167	25	2					1059		

Stats

15th Percentile :	31 MPH
50th Percentile :	36 MPH
85th Percentile :	41 MPH
95th Percentile :	43 MPH
Mean Speed(Average) :	37 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	6778
Percent in Pace :	70.9%
Number of Vehicles > 40 MPH :	2114
Percent of Vehicles > 40 MPH :	22.1%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	0	1	10	6	3	0	0	0	0	0	20	44	40
01:00	0	0	0	0	1	2	8	1	1	0	0	0	0	13	44	42
02:00	0	0	0	2	0	6	2	1	0	0	0	0	0	11	42	37
03:00	0	0	0	0	1	2	1	3	1	0	0	0	0	8	48	43
04:00	0	0	0	0	6	5	5	2	1	0	0	0	0	19	44	39
05:00	0	0	0	0	13	66	73	26	3	1	0	0	0	182	44	40
06:00	0	12	9	6	40	185	162	33	3	0	0	0	0	450	43	38
07:00	0	0	0	4	87	304	203	27	2	0	0	0	0	627	42	38
08:00	0	1	0	12	106	324	216	12	1	0	0	0	0	672	41	38
09:00	0	0	7	9	60	249	121	21	1	0	0	1	0	469	42	38
10:00	0	0	0	3	52	188	129	16	1	0	0	0	0	389	42	38
11:00	0	0	2	12	87	212	111	10	0	0	0	0	0	434	41	37
12 PM	0	0	1	7	80	209	106	15	2	0	0	0	0	420	41	38
13:00	0	0	1	17	87	177	107	13	0	0	0	0	0	402	41	37
14:00	0	1	5	26	207	314	93	5	0	0	0	0	0	651	39	36
15:00	173	123	117	48	112	99	19	1	0	0	0	0	0	692	34	22
16:00	356	238	154	40	29	28	7	0	0	0	0	0	0	852	23	16
17:00	157	126	41	42	163	352	81	11	0	0	0	0	0	973	38	28
18:00	0	0	0	6	122	324	183	20	1	0	0	0	0	656	41	38
19:00	0	0	0	6	61	110	57	12	1	0	0	0	0	247	41	37
20:00	0	0	0	7	41	81	58	3	0	0	0	0	0	190	41	37
21:00	0	0	0	3	27	87	43	2	0	0	0	0	0	162	41	37
22:00	0	0	0	1	55	72	23	3	0	0	0	0	0	154	39	36
23:00	0	0	0	6	13	18	24	1	0	0	0	0	0	62	42	37
Total %	686 7.8%	501 5.7%	337 3.8%	257 2.9%	1451 16.6%	3424 39.1%	1838 21.0%	241 2.8%	18 0.2%	1 0.0%	0 0.0%	1 0.0%	0 0.0%	8755		
AM Peak		06:00	06:00	08:00	08:00	08:00	08:00	06:00	05:00	05:00		09:00		08:00		
Vol.		12	9	12	106	324	216	33	3	1		1		672		
PM Peak	16:00	16:00	16:00	15:00	14:00	17:00	18:00	18:00	12:00					17:00		
Vol.	356	238	154	48	207	352	183	20	2					973		

Stats

15th Percentile : 20 MPH
50th Percentile : 35 MPH
85th Percentile : 41 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 33 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 5262
Percent in Pace : 60.1%
Number of Vehicles > 40 MPH : 1731
Percent of Vehicles > 40 MPH : 19.8%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/																
18	0	0	0	0	5	19	5	0	0	0	0	0	0	29	39	37
01:00	0	0	0	0	5	5	6	0	0	0	0	0	0	16	42	37
02:00	0	0	0	0	0	12	5	1	0	0	0	0	0	18	42	39
03:00	0	0	0	0	0	1	3	0	1	0	0	0	0	5	50	43
04:00	0	0	0	0	0	3	4	2	1	0	0	0	0	10	47	43
05:00	0	0	0	0	3	9	14	9	0	0	0	0	0	35	46	41
06:00	0	0	0	2	12	35	42	16	1	0	0	0	0	108	44	40
07:00	0	0	0	1	21	75	55	8	0	0	0	0	0	160	42	38
08:00	0	0	1	4	37	106	63	5	3	0	0	0	0	219	42	38
09:00	0	0	3	3	43	123	85	10	3	1	0	0	0	271	42	38
10:00	0	0	0	9	50	168	113	13	1	0	0	1	0	355	42	38
11:00	0	0	1	9	81	189	95	14	0	0	0	0	0	389	41	37
12 PM	0	0	1	8	57	200	131	19	0	0	0	0	0	416	42	38
13:00	0	0	4	29	108	226	106	14	2	0	0	0	0	489	41	37
14:00	0	0	1	17	135	249	86	15	0	0	0	0	0	503	40	36
15:00	0	2	2	13	66	192	117	18	1	0	0	0	0	411	42	38
16:00	0	0	0	12	63	165	127	16	1	0	0	0	0	384	42	38
17:00	0	0	1	2	35	147	109	20	1	0	0	0	0	315	42	39
18:00	1	0	0	1	31	127	108	14	0	0	0	0	0	282	42	39
19:00	0	0	1	2	38	121	60	17	1	0	0	0	1	241	42	38
20:00	0	0	0	4	25	71	59	9	0	0	0	0	0	168	42	38
21:00	0	0	0	8	15	79	50	7	0	0	0	0	0	159	42	38
22:00	0	0	0	1	22	54	58	9	0	0	0	0	0	144	42	39
23:00	0	1	0	0	11	37	20	5	2	0	0	0	0	76	42	38
Total	1	3	15	125	863	2413	1521	241	18	1	0	1	1	5203		
%	0.0%	0.1%	0.3%	2.4%	16.6%	46.4%	29.2%	4.6%	0.3%	0.0%	0.0%	0.0%	0.0%			
AM Peak			09:00	10:00	11:00	11:00	10:00	06:00	08:00	09:00		10:00		11:00		
Vol.			3	9	81	189	113	16	3	1		1		389		
PM Peak	18:00	15:00	13:00	13:00	14:00	14:00	12:00	17:00	13:00				19:00	14:00		
Vol.	1	2	4	29	135	249	131	20	2				1	503		

Stats

15th Percentile : 32 MPH
50th Percentile : 37 MPH
85th Percentile : 42 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 38 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 3934
Percent in Pace : 75.6%
Number of Vehicles > 40 MPH : 1479
Percent of Vehicles > 40 MPH : 28.4%



PRECISION
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INDUSTRIES, LLC

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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	1	11	21	3	1	1	0	0	0	38	43	41
01:00	0	0	0	0	2	13	8	3	0	0	0	0	0	26	43	39
02:00	0	0	0	0	2	12	2	0	0	0	0	0	0	16	38	37
03:00	0	0	0	0	0	2	6	1	0	0	1	0	0	10	46	44
04:00	0	0	0	0	0	3	3	5	1	1	0	0	0	13	49	45
05:00	0	0	0	1	1	7	8	1	2	0	0	0	0	20	44	40
06:00	0	0	0	0	7	27	31	16	2	0	0	0	0	83	45	41
07:00	0	0	0	3	7	33	36	11	2	0	0	0	0	92	43	40
08:00	0	1	0	0	18	33	76	18	0	0	0	0	0	146	43	40
09:00	0	0	0	3	16	101	76	12	0	1	0	0	0	209	42	39
10:00	0	0	2	11	55	129	98	15	0	0	0	0	0	310	42	38
11:00	0	0	1	8	68	148	77	13	1	0	0	0	0	316	41	37
12 PM	0	0	3	11	60	230	136	10	0	0	0	0	0	450	41	38
13:00	0	0	0	3	71	220	127	26	2	0	0	0	0	449	42	38
14:00	0	0	0	8	78	209	98	18	2	0	0	0	0	413	41	38
15:00	0	0	3	9	62	211	111	8	0	0	0	0	0	404	41	37
16:00	1	0	0	11	45	133	124	23	1	0	0	0	0	338	42	38
17:00	0	1	1	1	45	116	94	13	1	0	0	0	0	272	42	38
18:00	0	0	1	3	44	121	82	19	3	0	0	0	0	273	42	38
19:00	0	0	0	3	10	80	64	10	0	0	0	0	0	167	42	39
20:00	0	0	0	2	13	64	55	8	1	0	0	0	0	143	42	39
21:00	0	0	1	0	10	34	31	7	1	0	0	0	0	84	43	39
22:00	0	0	0	0	6	23	16	8	0	0	0	0	0	53	44	39
23:00	0	0	0	0	6	8	4	2	0	0	0	0	0	20	42	38
Total	1	2	12	77	627	1968	1384	250	20	3	1	0	0	4345		
%	0.0%	0.0%	0.3%	1.8%	14.4%	45.3%	31.9%	5.8%	0.5%	0.1%	0.0%	0.0%	0.0%			
AM Peak		08:00	10:00	10:00	11:00	11:00	10:00	08:00	05:00	00:00	03:00			11:00		
Vol.		1	2	11	68	148	98	18	2	1	1			316		
PM Peak	16:00	17:00	12:00	12:00	14:00	12:00	12:00	13:00	18:00					12:00		
Vol.	1	1	3	11	78	230	136	26	3					450		

Stats

15th Percentile :	33 MPH
50th Percentile :	37 MPH
85th Percentile :	42 MPH
95th Percentile :	45 MPH
Mean Speed(Average) :	38 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	3352
Percent in Pace :	77.1%
Number of Vehicles > 40 MPH :	1381
Percent of Vehicles > 40 MPH :	31.8%



PRECISION
D A T A
INDUSTRIES, LLC

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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	0	6	3	2	1	0	0	0	0	12	46	41
01:00	0	0	0	0	1	5	1	1	0	0	0	0	0	8	42	38
02:00	0	0	0	0	1	0	1	1	0	0	0	0	0	3	46	40
03:00	0	0	0	0	0	2	0	1	1	0	0	0	0	4	51	43
04:00	0	0	0	0	0	7	12	9	0	0	0	0	0	28	46	42
05:00	0	0	0	0	13	89	91	29	1	2	0	0	0	225	43	40
06:00	0	0	5	7	43	226	179	34	1	0	0	0	0	495	42	39
07:00	0	0	6	27	107	315	166	17	1	0	0	0	0	639	41	37
08:00	7	2	58	29	175	221	96	5	0	0	0	0	0	593	39	34
09:00	1	1	21	23	84	264	133	18	0	0	0	0	0	545	41	37
10:00	0	1	2	7	65	205	95	8	0	0	0	0	0	383	41	37
11:00	0	0	0	1	47	203	116	10	1	0	0	0	0	378	42	38
12 PM	1	0	0	9	73	237	115	16	0	0	0	0	0	451	41	38
13:00	0	0	0	14	77	180	114	19	1	0	0	0	0	405	42	38
14:00	0	0	0	6	74	278	121	20	0	0	0	0	0	499	41	38
15:00	0	0	0	11	119	396	216	25	1	0	0	0	0	768	41	38
16:00	0	0	6	29	186	464	221	18	1	0	0	0	0	925	41	37
17:00	0	0	7	56	304	423	157	15	2	1	0	0	0	965	39	36
18:00	0	0	0	4	74	385	148	16	1	0	0	0	0	628	41	38
19:00	0	0	0	2	36	143	117	9	0	0	0	0	0	307	42	39
20:00	0	0	0	2	21	105	66	13	0	1	0	0	0	208	42	39
21:00	0	0	0	1	14	79	41	11	1	0	0	0	0	147	42	39
22:00	0	0	0	0	3	18	33	10	2	0	0	0	0	66	45	41
23:00	0	0	0	0	2	11	31	1	0	0	0	0	0	45	43	40
Total	9	4	105	228	1519	4262	2273	308	15	4	0	0	0	8727		
%	0.1%	0.0%	1.2%	2.6%	17.4%	48.8%	26.0%	3.5%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	08:00	08:00	07:00	06:00	06:00	00:00	05:00				07:00		
Vol.	7	2	58	29	175	315	179	34	1	2				639		
PM Peak	12:00		17:00	17:00	17:00	16:00	16:00	15:00	17:00	17:00				17:00		
Vol.	1		7	56	304	464	221	25	2	1				965		

Stats

15th Percentile :	32 MPH
50th Percentile :	36 MPH
85th Percentile :	41 MPH
95th Percentile :	43 MPH
Mean Speed(Average) :	37 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	6535
Percent in Pace :	74.9%
Number of Vehicles > 40 MPH :	2145
Percent of Vehicles > 40 MPH :	24.6%



PRECISION
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INDUSTRIES, LLC

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3038-3076 Route 2A
east of Airport Road
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Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	1	1	4	4	2	0	0	0	0	0	12	44	39
01:00	0	0	0	0	0	4	2	0	0	0	0	0	0	6	41	39
02:00	0	0	0	0	3	3	1	0	0	0	0	0	0	7	38	36
03:00	0	0	0	0	1	0	2	0	1	0	0	0	0	4	51	42
04:00	0	0	0	0	2	5	11	5	2	0	0	0	0	25	47	42
05:00	0	0	0	2	23	78	85	29	5	0	0	0	0	222	44	40
06:00	0	0	0	9	62	231	187	30	3	0	0	0	0	522	42	39
07:00	1	0	17	33	111	312	185	18	2	0	0	0	0	679	41	37
08:00	1	0	5	25	163	325	158	7	0	0	0	0	0	684	40	37
09:00	1	11	6	18	155	294	99	10	0	0	0	0	0	594	40	36
10:00	0	0	1	8	75	200	94	18	0	0	0	0	0	396	41	37
11:00	0	1	0	3	71	178	94	10	1	0	0	0	0	358	41	38
12 PM	0	1	5	19	116	230	96	9	0	0	0	0	0	476	40	36
13:00	1	0	0	10	63	215	117	12	0	0	0	0	0	418	41	38
14:00	0	0	3	11	116	299	114	9	0	0	0	0	0	552	40	37
15:00	0	0	4	37	238	432	144	7	0	0	0	0	0	862	39	36
16:00	8	24	18	38	279	528	129	12	0	0	0	0	0	1036	38	35
17:00	0	9	29	64	262	454	145	10	1	0	0	0	0	974	39	35
18:00	0	0	1	16	153	355	140	18	1	0	0	0	0	684	41	37
19:00	0	0	1	6	30	157	105	17	0	0	0	0	0	316	42	38
20:00	0	0	0	1	17	86	66	9	3	0	0	0	0	182	42	39
21:00	0	0	0	0	25	74	70	10	1	0	0	0	0	180	42	39
22:00	0	1	0	2	4	28	38	4	1	0	0	0	0	78	43	39
23:00	0	0	0	1	5	20	15	2	1	0	0	0	0	44	42	39
Total	12	47	90	304	1975	4512	2101	248	22	0	0	0	0	9311		
%	0.1%	0.5%	1.0%	3.3%	21.2%	48.5%	22.6%	2.7%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	09:00	07:00	07:00	08:00	08:00	06:00	06:00	05:00					08:00		
Vol.	1	11	17	33	163	325	187	30	5					684		
PM Peak	16:00	16:00	17:00	17:00	16:00	16:00	17:00	18:00	20:00					16:00		
Vol.	8	24	29	64	279	528	145	18	3					1036		

Stats

15th Percentile : 31 MPH
50th Percentile : 36 MPH
85th Percentile : 41 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 37 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 6613
Percent in Pace : 71.0%
Number of Vehicles > 40 MPH : 1951
Percent of Vehicles > 40 MPH : 21.0%



PRECISION
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3038-3076 Route 2A
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WB

176038 A Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	0	3	9	8	2	0	0	0	0	0	22	43	39
01:00	0	0	0	0	1	2	3	1	0	0	0	0	0	7	43	40
02:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3	37	35
03:00	0	0	0	0	2	3	1	1	0	0	0	0	0	7	43	38
04:00	0	0	0	1	4	7	8	3	0	0	0	0	0	23	43	39
05:00	0	0	2	2	19	78	85	21	3	1	0	0	0	211	43	40
06:00	0	0	0	11	50	248	171	31	0	0	0	0	0	511	42	39
07:00	6	0	21	44	113	298	146	14	1	0	0	0	0	643	41	36
08:00	8	0	60	46	192	246	63	0	0	0	0	0	0	615	38	33
09:00	4	9	38	26	110	247	115	20	2	0	0	0	0	571	41	35
10:00	0	0	2	8	50	190	137	20	3	0	0	0	0	410	42	38
11:00	0	0	1	21	76	206	127	13	2	0	0	0	0	446	41	37
12 PM	1	0	0	12	90	218	133	15	0	0	0	0	0	469	41	37
13:00	0	0	5	8	66	240	132	11	0	0	0	0	0	462	41	38
14:00	0	1	1	21	107	277	142	7	2	0	0	0	0	558	41	37
15:00	1	0	0	16	168	443	175	21	0	0	0	0	0	824	41	37
16:00	61	35	56	69	290	413	83	7	0	0	0	0	0	1014	38	32
17:00	92	147	76	26	165	343	89	7	0	0	0	0	0	945	38	29
18:00	0	0	3	14	136	353	141	11	0	0	0	0	0	658	40	37
19:00	0	0	0	3	44	178	101	14	1	0	0	0	0	341	42	38
20:00	0	0	0	4	36	102	72	13	0	0	0	0	0	227	42	38
21:00	0	0	0	2	12	85	57	9	1	0	0	0	0	166	42	39
22:00	0	0	0	0	15	37	27	9	1	0	0	0	0	89	43	39
23:00	0	0	0	3	5	24	22	6	0	1	0	0	0	61	43	39
Total %	173 1.9%	192 2.1%	265 2.9%	337 3.6%	1755 18.9%	4249 45.8%	2038 22.0%	256 2.8%	16 0.2%	2 0.0%	0 0.0%	0 0.0%	0 0.0%	9283		
AM Peak	08:00	09:00	08:00	08:00	08:00	07:00	06:00	06:00	05:00	05:00				07:00		
Vol.	8	9	60	46	192	298	171	31	3	1				643		
PM Peak	17:00	17:00	17:00	16:00	16:00	15:00	15:00	15:00	14:00	23:00				16:00		
Vol.	92	147	76	69	290	443	175	21	2	1				1014		

Stats

15th Percentile :	30 MPH
50th Percentile :	36 MPH
85th Percentile :	41 MPH
95th Percentile :	43 MPH
Mean Speed(Average) :	36 MPH
10 MPH Pace Speed :	35-44 MPH
Number in Pace :	6287
Percent in Pace :	67.7%
Number of Vehicles > 40 MPH :	1904
Percent of Vehicles > 40 MPH :	20.5%



PRECISION
D A T A
INDUSTRIES, LLC

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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 A Volume
Site Code: TBA

Start	EB		WB		Combin		ed		4/5/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Thu	
12:00	3	136	7	97	10	233				
12:15	1	108	3	125	4	233				
12:30	1	104	4	134	5	238				
12:45	2	103	1	121	3	224	22	928		
01:00	0	106	7	119	7	225				
01:15	4	106	0	107	4	213				
01:30	31	102	2	102	33	204				
01:45	13	105	3	115	16	220	60	862		
02:00	2	135	1	135	3	270				
02:15	1	130	3	136	4	266				
02:30	0	138	1	152	1	290				
02:45	5	133	1	160	6	293	14	1119		
03:00	1	140	2	208	3	348				
03:15	0	144	0	216	0	360				
03:30	3	137	2	252	5	389				
03:45	3	151	3	224	6	375	14	1472		
04:00	5	130	5	248	10	378				
04:15	2	138	6	254	8	392				
04:30	12	111	1	260	13	371				
04:45	8	100	6	286	14	386	45	1527		
05:00	14	144	13	259	27	403				
05:15	34	114	30	267	64	381				
05:30	39	117	63	287	102	404				
05:45	70	109	107	246	177	355	370	1543		
06:00	62	81	97	200	159	281				
06:15	98	86	129	180	227	266				
06:30	125	93	144	170	269	263				
06:45	205	83	145	110	350	193	1005	1003		
07:00	201	79	131	104	332	183				
07:15	215	53	156	110	371	163				
07:30	221	58	204	88	425	146				
07:45	233	45	185	62	418	107	1546	599		
08:00	202	37	169	53	371	90				
08:15	234	35	139	46	373	81				
08:30	206	34	171	60	377	94				
08:45	233	26	169	60	402	86	1523	351		
09:00	207	36	162	55	369	91				
09:15	203	29	151	50	354	79				
09:30	228	27	113	39	341	66				
09:45	202	22	102	24	304	46	1368	282		
10:00	145	10	125	25	270	35				
10:15	121	22	105	22	226	44				
10:30	112	23	113	18	225	41				
10:45	75	11	85	17	160	28	881	148		
11:00	84	18	113	16	197	34				
11:15	101	12	120	9	221	21				
11:30	91	3	119	10	210	13				
11:45	140	9	97	10	237	19	865	87		
Total	4198	3873	3515	6048	7713	9921				
Percent	54.4%	39.0%	45.6%	61.0%						
Day Total		8071		9563		17634				
Peak	07:30	-	03:00	-	07:15	-	04:45	-	07:30	-
Vol.	890	-	572	-	714	-	1099	-	1587	-
P.H.F.	0.951	-	0.947	-	0.875	-	0.957	-	0.934	-



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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 A Volume
Site Code: TBA

Start	EB		WB		Combin		ed		4/6/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Fri	
12:00	3	102	5	114	8	216				
12:15	6	107	7	121	13	228				
12:30	0	93	8	98	8	191				
12:45	0	88	0	87	0	175	29	810		
01:00	0	87	2	108	2	195				
01:15	1	131	5	97	6	228				
01:30	4	106	2	99	6	205				
01:45	1	107	4	98	5	205	19	833		
02:00	4	130	4	148	8	278				
02:15	0	120	3	133	3	253				
02:30	3	131	1	169	4	300				
02:45	42	104	3	201	45	305	60	1136		
03:00	4	113	1	243	5	356				
03:15	1	126	1	122	2	248				
03:30	6	118	3	144	9	262				
03:45	3	117	3	183	6	300	22	1166		
04:00	3	89	7	205	10	294				
04:15	5	94	3	227	8	321				
04:30	3	101	1	201	4	302				
04:45	14	81	8	219	22	300	44	1217		
05:00	14	84	9	205	23	289				
05:15	24	87	31	244	55	331				
05:30	38	99	56	268	94	367				
05:45	48	87	86	256	134	343	306	1330		
06:00	60	80	97	247	157	327				
06:15	88	94	106	189	194	283				
06:30	134	70	117	131	251	201				
06:45	142	70	130	89	272	159	874	970		
07:00	166	75	124	82	290	157				
07:15	178	71	155	63	333	134				
07:30	170	50	173	52	343	102				
07:45	197	36	175	50	372	86	1338	479		
08:00	200	42	189	56	389	98				
08:15	191	35	158	46	349	81				
08:30	191	38	176	46	367	84				
08:45	218	32	149	42	367	74	1472	337		
09:00	168	27	143	47	311	74				
09:15	182	13	132	41	314	54				
09:30	120	24	109	34	229	58				
09:45	109	32	85	40	194	72	1048	258		
10:00	117	24	99	47	216	71				
10:15	106	23	93	47	199	70				
10:30	91	20	92	33	183	53				
10:45	106	19	105	27	211	46	809	240		
11:00	104	22	95	19	199	41				
11:15	123	17	97	8	220	25				
11:30	112	20	117	20	229	40				
11:45	105	11	125	15	230	26	878	132		
Total	3605	3447	3294	5461	6899	8908				
Percent	52.3%	38.7%	47.7%	61.3%						
Day Total		7052		8755		15807				
Peak	08:00	-	01:45	-	07:45	-	07:45	-	05:15	-
Vol.	800	-	488	-	698	-	1477	-	1368	-
P.H.F.	0.917	-	0.931	-	0.923	-	0.949	-	0.932	-



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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 A Volume
Site Code: TBA

Start	EB		WB		Combin		ed		4/7/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Sat	
12:00	8	108	11	121	19	229				
12:15	11	93	6	93	17	186				
12:30	3	90	5	105	8	195				
12:45	2	105	7	97	9	202	53	812		
01:00	2	98	9	118	11	216				
01:15	1	101	5	118	6	219				
01:30	5	114	0	106	5	220				
01:45	1	103	2	147	3	250	25	905		
02:00	3	101	8	106	11	207				
02:15	2	106	5	133	7	239				
02:30	2	105	3	136	5	241				
02:45	2	125	2	128	4	253	27	940		
03:00	0	105	0	93	0	198				
03:15	2	114	1	104	3	218				
03:30	0	91	2	99	2	190				
03:45	2	113	2	115	4	228	9	834		
04:00	0	120	3	91	3	211				
04:15	2	129	4	98	6	227				
04:30	3	118	0	106	3	224				
04:45	3	98	3	89	6	187	18	849		
05:00	5	94	6	85	11	179				
05:15	6	107	5	88	11	195				
05:30	9	75	10	67	19	142				
05:45	8	76	14	75	22	151	63	667		
06:00	13	70	21	70	34	140				
06:15	12	75	26	65	38	140				
06:30	20	75	31	86	51	161				
06:45	14	58	30	61	44	119	167	560		
07:00	30	62	36	73	66	135				
07:15	26	57	34	69	60	126				
07:30	43	44	46	55	89	99				
07:45	51	29	44	44	95	73	310	433		
08:00	45	35	37	48	82	83				
08:15	62	19	58	40	120	59				
08:30	74	27	65	43	139	70				
08:45	82	24	59	37	141	61	482	273		
09:00	68	28	62	36	130	64				
09:15	82	20	66	37	148	57				
09:30	77	19	78	41	155	60				
09:45	93	18	65	45	158	63	591	244		
10:00	76	13	70	42	146	55				
10:15	104	32	88	45	192	77				
10:30	91	21	93	36	184	57				
10:45	91	17	104	21	195	38	717	227		
11:00	91	26	80	18	171	44				
11:15	81	13	78	26	159	39				
11:30	91	19	107	19	198	38				
11:45	97	6	124	13	221	19	749	140		
Total	1596	3296	1615	3588	3211	6884				
Percent	49.7%	47.9%	50.3%	52.1%						
Day Total		4892		5203		10095				
Peak	10:15	-	03:45	-	11:00	-	02:00	-	-	-
Vol.	377	-	480	-	389	-	940	-	-	-
P.H.F.	0.906	-	0.930	-	0.784	-	0.847	-	-	-



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3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 A Volume
Site Code: TBA

Start	EB				WB				Combin		4/8/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Sun	
12:00	6		94		11		91		17	185		
12:15	3		83		15		117		18	200		
12:30	6		95		6		126		12	221		
12:45	3	18	119	391	6	38	116	450	9	235	841	
01:00	1		83		8		120		9	203		
01:15	0		100		11		115		11	215		
01:30	3		127		2		107		5	234		
01:45	2	6	102	412	5	26	107	449	7	209	861	
02:00	5		101		5		98		10	199		
02:15	1		89		2		105		3	194		
02:30	1		87		6		97		7	184		
02:45	2	9	88	365	3	16	113	413	5	201	778	
03:00	2		76		3		111		5	187		
03:15	1		72		0		107		1	179		
03:30	1		101		4		102		5	203		
03:45	0	4	99	348	3	10	84	404	3	183	752	
04:00	0		91		3		89		3	180		
04:15	3		71		5		81		8	152		
04:30	1		94		2		83		3	177		
04:45	0	4	74	330	3	13	85	338	3	159	668	
05:00	1		73		2		78		3	151		
05:15	4		83		8		64		12	147		
05:30	5		67		6		63		11	130		
05:45	1	11	69	292	4	20	67	272	5	136	564	
06:00	4		55		8		69		12	124		
06:15	13		61		25		84		38	145		
06:30	10		55		29		56		39	111		
06:45	16	43	50	221	21	83	64	273	37	114	494	
07:00	23		64		16		49		39	113		
07:15	31		33		23		46		54	79		
07:30	27		42		21		38		48	80		
07:45	28	109	20	159	32	92	34	167	60	54	326	
08:00	25		24		27		33		52	57		
08:15	38		38		43		37		81	75		
08:30	46		23		36		35		82	58		
08:45	83	192	18	103	40	146	38	143	123	56	246	
09:00	60		21		41		22		101	43		
09:15	65		13		43		14		108	27		
09:30	67		18		57		21		124	39		
09:45	74	266	11	63	68	209	27	84	142	38	147	
10:00	56		22		45		16		101	38		
10:15	64		18		70		18		134	36		
10:30	72		11		98		13		170	24		
10:45	114	306	11	62	97	310	6	53	211	17	115	
11:00	83		10		72		5		155	15		
11:15	72		11		78		4		150	15		
11:30	74		14		78		4		152	18		
11:45	106	335	9	44	88	316	7	20	194	16	64	
Total	1303		2790		1279		3066		2582	5856		
Percent	50.5%		47.6%		49.5%		52.4%					
Day Total		4093			4345				8438			
Peak	10:45	-	01:15	-	10:30	-	00:15	-	10:30	-	00:45	-
Vol.	343	-	430	-	345	-	479	-	686	-	887	-
P.H.F.	0.752		0.846		0.880		0.950		0.813		0.944	



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176038 A Volume
Site Code: TBA

Start	EB		WB		Combin		ed		4/9/2018
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Mon
12:00	7	86	6	97	13	183			
12:15	5	101	4	113	9	214			
12:30	6	100	2	110	8	210			
12:45	5	87	0	131	5	218	35	825	
01:00	3	101	2	75	5	176			
01:15	5	98	2	101	7	199			
01:30	1	85	2	114	3	199			
01:45	0	87	2	115	2	202	17	776	
02:00	1	126	0	110	1	236			
02:15	0	108	1	117	1	225			
02:30	1	150	2	137	3	287			
02:45	2	131	0	135	2	266	7	1014	
03:00	0	153	2	174	2	327			
03:15	1	143	2	196	3	339			
03:30	1	108	0	195	1	303			
03:45	1	140	0	203	1	343	7	1312	
04:00	4	131	3	222	7	353			
04:15	5	128	9	263	14	391			
04:30	6	129	3	195	9	324			
04:45	16	106	13	245	29	351	59	1419	
05:00	12	97	11	281	23	378			
05:15	33	123	40	246	73	369			
05:30	39	117	73	244	112	361			
05:45	56	116	101	194	157	310	365	1418	
06:00	80	86	102	191	182	277			
06:15	88	87	125	165	213	252			
06:30	159	74	130	145	289	219			
06:45	206	81	138	127	344	208	1028	956	
07:00	217	69	122	112	339	181			
07:15	214	64	137	75	351	139			
07:30	219	53	205	71	424	124			
07:45	191	49	175	49	366	98	1480	542	
08:00	216	31	158	63	374	94			
08:15	219	24	153	52	372	76			
08:30	193	20	130	48	323	68			
08:45	232	33	152	45	384	78	1453	316	
09:00	185	31	155	58	340	89			
09:15	171	37	120	32	291	69			
09:30	152	22	138	30	290	52			
09:45	135	14	132	27	267	41	1188	251	
10:00	104	16	105	23	209	39			
10:15	92	13	102	14	194	27			
10:30	112	10	80	16	192	26			
10:45	78	6	96	13	174	19	769	111	
11:00	92	15	97	12	189	27			
11:15	102	16	91	16	193	32			
11:30	87	5	95	9	182	14			
11:45	99	3	95	8	194	11	758	84	
Total	3853	3610	3313	5414	7166	9024			
Percent	53.8%	40.0%	46.2%	60.0%					
Day Total		7463		8727		16190			
Peak	08:00	-	02:30	-	07:30	-	04:45	-	-
Vol.	860	-	577	-	691	-	1536	-	1459
P.H.F.	0.927	-	0.943	-	0.843	-	0.906	-	0.965



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176038 A Volume
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Start	EB		WB		Combin		ed		4/10/201	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	8	Tue
12:00	4	89	3	140	7	229				
12:15	3	119	3	130	6	249				
12:30	4	103	2	112	6	215				
12:45	6	112	4	94	10	206	29	899		
01:00	2	102	1	113	3	215				
01:15	1	110	1	91	2	201				
01:30	4	92	0	96	4	188				
01:45	1	115	4	118	5	233	14	837		
02:00	1	121	1	131	2	252				
02:15	3	127	0	127	3	254				
02:30	0	129	4	153	4	282				
02:45	4	119	2	141	6	260	15	1048		
03:00	1	155	0	170	1	325				
03:15	0	127	0	204	0	331				
03:30	3	103	1	240	4	343				
03:45	0	141	3	248	3	389	8	1388		
04:00	2	128	2	253	4	381				
04:15	7	137	5	236	12	373				
04:30	9	120	8	274	17	394				
04:45	17	108	10	273	27	381	60	1529		
05:00	13	101	18	265	31	366				
05:15	33	116	38	247	71	363				
05:30	46	99	70	245	116	344				
05:45	65	113	96	217	161	330	379	1403		
06:00	66	88	114	227	180	315				
06:15	99	90	130	178	229	268				
06:30	150	92	140	166	290	258				
06:45	207	89	138	113	345	202	1044	1043		
07:00	253	69	163	119	416	188				
07:15	237	55	170	73	407	128				
07:30	249	41	172	73	421	114				
07:45	221	47	174	51	395	98	1639	528		
08:00	192	31	181	55	373	86				
08:15	242	32	159	43	401	75				
08:30	211	40	170	40	381	80				
08:45	196	24	174	44	370	68	1525	309		
09:00	202	25	164	54	366	79				
09:15	223	25	133	50	356	75				
09:30	154	20	136	41	290	61				
09:45	135	23	161	35	296	58	1308	273		
10:00	110	22	104	26	214	48				
10:15	101	18	95	23	196	41				
10:30	106	15	96	18	202	33				
10:45	95	11	101	11	196	22	808	144		
11:00	94	15	95	16	189	31				
11:15	103	11	93	9	196	20				
11:30	101	5	91	8	192	13				
11:45	114	3	79	11	193	14	770	78		
Total	4090	3677	3509	5802	7599	9479				
Percent	53.8%	38.8%	46.2%	61.2%						
Day Total		7767		9311		17078				
Peak	07:00	-	02:15	-	07:15	-	04:30	-	07:00	-
Vol.	960	-	530	-	697	-	1059	-	1639	-
P.H.F.	0.949	-	0.855	-	0.963	-	0.966	-	0.973	-



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

3038-3076 Route 2A
east of Airport Road
City, State: Lexington, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 A Volume
Site Code: TBA

Start	EB		WB		Combin		ed		4/11/201	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	8	Wed
12:00	3	107	5	127	8	234				
12:15	2	112	4	111	6	223				
12:30	2	114	8	110	10	224				
12:45	4	111	5	121	9	232	913			
01:00	1	98	2	124	3	222				
01:15	2	105	3	124	5	229				
01:30	0	126	0	115	0	241				
01:45	31	114	2	99	33	213	905			
02:00	11	133	1	129	12	262				
02:15	1	121	1	135	2	256				
02:30	4	130	0	129	4	259				
02:45	3	133	1	165	4	298	1075			
03:00	2	146	1	180	3	326				
03:15	3	138	1	196	4	334				
03:30	1	144	1	233	2	377				
03:45	1	135	4	215	5	350	1387			
04:00	4	129	3	225	7	354				
04:15	6	114	7	261	13	375				
04:30	11	109	4	264	15	373				
04:45	8	119	9	264	17	383	1485			
05:00	22	99	13	258	35	357				
05:15	29	105	27	212	56	317				
05:30	36	124	68	239	104	363				
05:45	49	119	103	236	152	355	1392			
06:00	79	100	110	216	189	316				
06:15	90	94	114	155	204	249				
06:30	134	86	132	166	266	252				
06:45	203	95	155	121	358	216	1033			
07:00	233	63	150	112	383	175				
07:15	234	61	167	80	401	141				
07:30	240	63	163	79	403	142				
07:45	220	60	163	70	383	130	588			
08:00	220	50	163	62	383	112				
08:15	223	35	159	62	382	97				
08:30	232	28	149	52	381	80				
08:45	181	25	144	51	325	76	365			
09:00	232	29	117	49	349	78				
09:15	195	23	161	48	356	71				
09:30	173	21	151	35	324	56				
09:45	142	13	142	34	284	47	252			
10:00	114	26	99	28	213	54				
10:15	113	13	110	19	223	32				
10:30	93	13	117	19	210	32				
10:45	96	10	84	23	180	33	151			
11:00	111	16	103	16	214	32				
11:15	100	10	101	14	201	24				
11:30	108	9	106	16	214	25				
11:45	100	7	136	15	236	22	103			
Total	4102	3835	3469	5814	7571	9649				
Percent	54.2%	39.7%	45.8%	60.3%						
Day Total		7937		9283		17220				
Peak	07:00	-	03:00	-	07:15	-	04:15	-	-	-
Vol.	927	-	563	-	656	-	1047	-	1488	-
P.H.F.	0.966	-	0.964	-	0.982	-	0.991	-	0.974	-



PRECISION
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INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 B Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	2	1	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
05:00	0	15	1	0	0	0	0	0	0	0	0	0	0	16
06:00	0	61	5	0	1	0	0	0	0	0	0	0	0	67
07:00	0	134	10	5	2	0	0	0	0	0	0	0	0	151
08:00	0	179	15	1	3	1	0	1	0	0	0	0	0	200
09:00	0	96	17	0	5	0	0	0	1	0	0	0	0	119
10:00	0	47	10	1	1	0	0	1	0	0	0	0	0	60
11:00	0	52	9	0	3	1	0	0	0	0	0	0	0	65
12 PM	0	63	16	1	0	0	1	0	0	0	0	0	0	81
13:00	0	52	10	0	4	0	0	0	0	0	0	0	0	66
14:00	0	69	13	2	1	0	0	0	0	0	0	0	0	85
15:00	0	107	16	2	1	0	0	0	0	0	0	0	0	126
16:00	1	118	14	0	1	0	0	0	0	0	0	0	0	134
17:00	0	105	14	0	2	1	0	1	0	0	0	0	0	123
18:00	0	70	10	1	2	0	0	0	0	0	0	0	0	83
19:00	0	51	3	0	0	0	0	0	0	0	0	0	0	54
20:00	0	31	4	0	0	0	0	0	0	0	0	0	0	35
21:00	0	19	0	0	0	0	0	0	0	0	0	0	0	19
22:00	0	8	1	0	0	0	0	0	0	0	0	0	0	9
23:00	0	7	2	0	0	0	0	0	0	0	0	0	0	9
Total	1	1292	171	13	26	3	1	3	1	0	0	0	0	1511
Percent	0.1%	85.5%	11.3%	0.9%	1.7%	0.2%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak		08:00	09:00	07:00	09:00	08:00		08:00	09:00					08:00
Vol.		179	17	5	5	1		1	1					200
PM Peak	16:00	16:00	12:00	14:00	13:00	17:00	12:00	17:00						16:00
Vol.	1	118	16	2	4	1	1	1						134



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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 B Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	5	0	0	0	0	0	0	0	0	0	0	0	5
01:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
05:00	0	17	0	0	0	0	0	0	0	0	0	0	0	17
06:00	0	42	5	1	1	0	0	0	0	0	0	0	0	49
07:00	1	151	12	4	1	0	0	0	0	0	0	0	0	169
08:00	0	146	13	1	3	0	0	0	0	0	0	0	0	163
09:00	0	89	16	0	1	0	0	0	0	0	0	0	0	106
10:00	0	56	7	0	2	1	0	0	0	0	0	0	0	66
11:00	0	45	9	2	2	0	0	0	0	0	0	0	0	58
12 PM	0	66	10	1	3	1	0	1	1	0	0	0	0	83
13:00	0	50	14	0	2	1	0	0	0	0	0	0	0	67
14:00	0	90	15	2	2	0	0	0	0	0	0	0	0	109
15:00	2	114	28	3	1	1	0	1	0	0	0	0	0	150
16:00	0	95	16	0	2	0	0	0	0	0	0	0	0	113
17:00	0	103	11	0	0	0	0	0	0	0	0	0	0	114
18:00	0	72	7	0	2	1	0	0	0	0	0	0	0	82
19:00	0	32	3	0	0	0	0	0	0	0	0	0	0	35
20:00	0	24	2	0	0	0	0	0	0	0	0	0	0	26
21:00	0	24	0	0	0	0	0	0	0	0	0	0	0	24
22:00	0	14	3	0	0	0	0	0	0	0	0	0	0	17
23:00	0	7	2	0	0	0	0	0	0	0	0	0	0	9
Total	3	1252	173	14	22	5	0	2	1	0	0	0	0	1472
Percent	0.2%	85.1%	11.8%	1.0%	1.5%	0.3%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	09:00	07:00	08:00	10:00								07:00
Vol.	1	151	16	4	3	1								169
PM Peak	15:00	15:00	15:00	15:00	12:00	12:00		12:00	12:00					15:00
Vol.	2	114	28	3	3	1		1	1					150



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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 B Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/07/1														
8	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
02:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:00	0	9	1	0	0	0	0	0	0	0	0	0	0	10
07:00	0	22	4	0	2	0	0	0	0	0	0	0	0	28
08:00	1	46	12	0	1	0	0	0	0	0	0	0	0	60
09:00	0	71	6	0	1	0	0	0	0	0	0	0	0	78
10:00	0	117	15	0	3	0	0	0	0	0	0	0	0	135
11:00	0	104	22	0	4	0	0	0	0	0	0	0	0	130
12 PM	0	115	7	0	2	0	0	0	0	0	0	0	0	124
13:00	0	118	10	0	2	0	0	0	0	0	0	0	0	130
14:00	0	115	10	0	3	0	0	2	0	0	0	0	0	130
15:00	1	92	8	0	0	0	0	0	0	0	0	0	0	101
16:00	0	55	6	0	2	0	0	0	0	0	0	0	0	63
17:00	1	52	0	0	1	0	0	0	0	0	0	0	0	54
18:00	0	42	2	0	0	0	0	0	0	0	0	0	0	44
19:00	0	23	3	0	0	0	0	0	0	0	0	0	0	26
20:00	0	17	1	0	0	0	0	0	0	0	0	0	0	18
21:00	0	13	1	0	0	0	0	0	0	0	0	0	0	14
22:00	0	19	1	0	0	0	0	0	0	0	0	0	0	20
23:00	0	17	0	0	0	0	0	0	0	0	0	0	0	17
Total	3	1057	111	0	21	0	0	2	0	0	0	0	0	1194
Percent	0.3%	88.5%	9.3%	0.0%	1.8%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	10:00	11:00		11:00									10:00
Vol.	1	117	22		4									135
PM Peak	15:00	13:00	13:00		14:00			14:00						13:00
Vol.	1	118	10		3			2						130



PRECISION
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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 B Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	3	1	0	0	0	0	0	0	0	0	0	0	4
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
05:00	0	20	3	0	0	0	0	0	0	0	0	0	0	23
06:00	0	50	6	0	2	0	0	0	0	0	0	0	0	58
07:00	2	174	12	5	1	0	0	0	0	0	0	0	0	194
08:00	0	177	20	0	2	0	0	0	0	0	0	0	0	199
09:00	1	81	16	0	4	0	0	0	0	0	0	0	0	102
10:00	0	45	11	0	2	0	0	0	0	0	0	0	0	58
11:00	0	43	8	0	4	0	0	1	0	0	0	0	0	56
12 PM	0	69	9	1	1	0	0	1	0	0	0	0	0	81
13:00	1	53	9	0	0	0	0	0	0	0	0	0	0	63
14:00	0	57	15	3	1	0	0	0	0	1	0	0	0	77
15:00	0	71	18	2	1	1	0	0	0	0	0	0	0	93
16:00	1	110	17	0	3	0	0	0	0	0	0	0	0	131
17:00	0	111	12	0	0	0	0	0	0	0	0	0	0	123
18:00	0	81	6	0	1	0	0	0	0	0	0	0	0	88
19:00	0	46	4	0	1	0	0	0	0	0	0	0	0	51
20:00	0	16	5	0	1	0	0	0	0	0	0	0	0	22
21:00	0	14	1	0	0	0	0	0	0	0	0	0	0	15
22:00	0	9	2	0	0	0	0	0	0	0	0	0	0	11
23:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
Total	5	1238	176	11	24	1	0	2	0	1	0	0	0	1458
Percent	0.3%	84.9%	12.1%	0.8%	1.6%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	08:00	07:00	09:00			11:00						08:00
Vol.	2	177	20	5	4			1						199
PM Peak	13:00	17:00	15:00	14:00	16:00	15:00		12:00		14:00				16:00
Vol.	1	111	18	3	3	1		1		1				131



PRECISION
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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 B Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	7	0	0	0	0	0	0	0	0	0	0	0	7
01:00	0	1	0	0	1	0	0	0	0	0	0	0	0	2
02:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
05:00	0	14	4	0	0	0	0	0	0	0	0	0	0	18
06:00	0	69	9	0	0	0	0	0	0	0	0	0	0	78
07:00	0	159	12	5	2	0	0	2	0	0	0	0	0	180
08:00	0	175	21	0	2	0	0	1	0	0	0	0	0	199
09:00	0	97	18	2	4	0	0	1	0	0	0	0	0	122
10:00	0	49	9	0	2	1	0	0	1	0	0	0	0	62
11:00	0	54	9	1	3	0	0	0	0	0	0	0	0	67
12 PM	0	62	13	0	3	0	0	0	1	0	0	0	0	79
13:00	0	45	15	1	1	0	0	0	0	1	0	0	0	63
14:00	0	58	13	1	3	0	0	0	0	0	0	0	0	75
15:00	0	94	25	3	6	2	0	0	0	0	0	0	0	130
16:00	0	121	16	0	0	0	0	0	0	0	0	0	0	137
17:00	0	98	16	2	2	0	0	0	0	0	0	0	0	118
18:00	0	79	9	1	3	0	0	1	0	0	0	0	0	93
19:00	0	38	6	0	2	0	0	0	0	0	0	0	0	46
20:00	0	18	1	0	0	0	0	0	0	0	0	0	0	19
21:00	0	15	0	0	0	0	0	0	0	0	0	0	0	15
22:00	0	13	2	0	0	0	0	0	0	0	0	0	0	15
23:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
Total	0	1278	199	16	34	3	0	5	2	1	0	0	0	1538
Percent	0.0%	83.1%	12.9%	1.0%	2.2%	0.2%	0.0%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	
AM		08:00	08:00	07:00	09:00	10:00		07:00	10:00					08:00
Peak Vol.		175	21	5	4	1		2	1					199
PM		16:00	15:00	15:00	15:00	15:00		18:00	12:00	13:00				16:00
Peak Vol.		121	25	3	6	2		1	1	1				137



PRECISION
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46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 B Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
05:00	0	16	2	0	0	0	0	0	0	0	0	0	0	18
06:00	0	60	10	1	0	0	0	0	0	0	0	0	0	71
07:00	0	162	16	6	3	0	0	0	0	0	0	0	0	187
08:00	0	156	14	0	2	2	0	0	0	0	0	0	0	174
09:00	1	139	24	2	4	1	0	0	0	0	0	0	0	171
10:00	0	87	16	0	0	0	0	0	0	0	0	0	0	103
11:00	0	85	11	0	0	0	0	0	0	0	0	0	0	96
12 PM	0	118	16	1	3	1	0	0	0	1	0	0	0	140
13:00	0	88	12	1	2	0	0	1	0	0	0	0	0	104
14:00	1	99	18	0	1	1	1	0	0	0	0	0	0	121
15:00	1	107	24	0	1	2	0	0	0	0	0	0	0	135
16:00	3	103	10	0	1	0	0	1	0	0	0	0	0	118
17:00	0	97	11	0	2	1	0	2	0	0	0	0	0	113
18:00	0	83	9	0	4	0	0	0	0	0	0	0	0	96
19:00	0	50	5	0	0	0	0	0	0	0	0	0	0	55
20:00	0	23	3	0	0	0	0	0	0	0	0	0	0	26
21:00	0	23	1	0	0	0	0	0	0	0	0	0	0	24
22:00	0	10	1	0	0	0	0	0	0	0	0	0	0	11
23:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
Total	6	1518	203	11	23	8	1	4	0	1	0	0	0	1775
Percent	0.3%	85.5%	11.4%	0.6%	1.3%	0.5%	0.1%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	09:00	07:00	09:00	08:00								07:00
Vol.	1	162	24	6	4	2								187
PM Peak	16:00	12:00	15:00	12:00	18:00	15:00	14:00	17:00		12:00				12:00
Vol.	3	118	24	1	4	2	1	2		1				140



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04/05/1														
8	0	4	0	0	0	0	0	0	0	0	0	0	0	4
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
05:00	0	14	7	0	0	0	0	0	0	0	0	0	0	21
06:00	0	152	20	0	2	0	0	0	0	0	0	0	0	174
07:00	0	287	33	3	3	0	0	0	0	0	0	0	0	326
08:00	0	285	32	0	7	2	0	0	0	0	0	0	0	326
09:00	0	203	27	1	3	0	0	0	0	0	0	0	0	234
10:00	0	62	10	0	4	1	0	1	0	0	0	0	0	78
11:00	0	58	13	0	1	0	0	0	0	0	0	0	0	72
12 PM	0	75	10	0	3	0	0	0	0	0	0	0	0	88
13:00	0	62	10	0	0	0	0	0	0	0	0	0	0	72
14:00	0	93	12	2	3	0	0	0	0	0	0	0	0	110
15:00	1	264	42	4	5	0	0	0	0	0	0	0	0	316
16:00	1	274	21	0	4	0	0	0	0	0	0	0	0	300
17:00	2	324	24	0	0	1	0	0	0	0	0	0	0	351
18:00	0	105	11	0	1	0	0	0	0	0	0	0	0	117
19:00	0	48	3	0	1	0	0	0	0	0	0	0	0	52
20:00	0	27	5	0	0	0	0	0	0	0	0	0	0	32
21:00	0	12	3	0	0	0	0	0	0	0	0	0	0	15
22:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
23:00	0	9	0	0	0	0	0	0	0	0	0	0	0	9
Total	4	2371	285	10	37	4	0	1	0	0	0	0	0	2712
Percent	0.1%	87.4%	10.5%	0.4%	1.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		07:00	07:00	07:00	08:00	08:00		10:00						07:00
Vol.		287	33	3	7	2		1						326
PM Peak	17:00	17:00	15:00	15:00	15:00	17:00								17:00
Vol.	2	324	42	4	5	1								351



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04/06/1														
8	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
05:00	0	20	3	0	0	0	0	0	0	0	0	0	0	23
06:00	0	108	13	0	5	0	0	0	0	0	0	0	0	126
07:00	0	193	28	3	2	2	0	2	0	0	0	0	0	230
08:00	1	190	27	3	1	0	0	0	0	0	0	0	0	222
09:00	1	80	21	0	4	0	0	0	0	0	0	0	0	106
10:00	0	57	13	0	2	0	0	0	0	0	0	0	0	72
11:00	0	80	5	1	2	1	0	0	0	0	0	0	0	89
12 PM	0	59	12	1	1	0	0	0	0	0	0	0	0	73
13:00	0	53	7	0	0	0	0	1	0	0	0	0	0	61
14:00	0	150	27	2	3	0	0	0	0	0	0	0	0	182
15:00	2	257	41	3	3	1	0	1	0	0	0	0	0	308
16:00	0	327	36	1	2	0	0	0	0	0	0	0	0	366
17:00	0	205	22	1	0	0	0	0	0	0	0	0	0	228
18:00	0	91	8	0	0	0	0	0	0	0	0	0	0	99
19:00	0	39	6	0	1	0	0	0	0	0	0	0	0	46
20:00	0	22	5	0	0	0	0	0	0	0	0	0	0	27
21:00	0	21	2	0	0	0	0	0	0	0	0	0	0	23
22:00	0	17	2	0	0	0	0	0	0	0	0	0	0	19
23:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
Total	4	1982	280	15	26	4	0	4	0	0	0	0	0	2315
Percent	0.2%	85.6%	12.1%	0.6%	1.1%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	07:00	07:00	06:00	07:00		07:00						07:00
Vol.	1	193	28	3	5	2		2						230
PM Peak	15:00	16:00	15:00	15:00	14:00	15:00		13:00						16:00
Vol.	2	327	41	3	3	1		1						366



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04/09/1														
8	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
05:00	0	22	7	0	1	0	0	0	0	0	0	0	0	30
06:00	0	156	15	0	3	0	0	0	0	0	0	0	0	174
07:00	0	263	41	1	5	0	0	3	0	0	0	0	0	313
08:00	0	297	36	1	5	0	0	3	0	0	0	0	0	342
09:00	0	130	26	1	5	1	0	0	0	0	0	0	0	163
10:00	0	48	7	0	3	0	0	0	0	0	0	0	0	58
11:00	0	46	11	1	3	0	0	0	0	0	0	0	0	61
12 PM	0	54	11	1	2	0	0	0	0	0	0	0	0	68
13:00	0	47	8	1	5	0	0	0	0	0	0	0	0	61
14:00	0	81	13	3	3	0	0	0	0	0	0	0	0	100
15:00	0	135	35	1	1	0	0	0	0	0	0	0	0	172
16:00	0	262	25	0	0	1	0	1	0	0	0	0	0	289
17:00	1	228	19	0	1	0	0	0	0	0	0	0	0	249
18:00	0	113	10	0	0	0	0	0	0	0	0	0	0	123
19:00	0	35	2	0	0	0	0	0	0	0	0	0	0	37
20:00	0	31	4	0	0	0	0	0	0	0	0	0	0	35
21:00	0	21	1	0	0	0	0	0	0	0	0	0	0	22
22:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
23:00	0	8	0	0	0	0	0	0	0	0	0	0	0	8
Total	1	1992	272	10	37	2	0	7	0	0	0	0	0	2321
Percent	0.0%	85.8%	11.7%	0.4%	1.6%	0.1%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		08:00	07:00	07:00	07:00	09:00		07:00						08:00
Vol.		297	41	1	5	1		3						342
PM Peak	17:00	16:00	15:00	14:00	13:00	16:00		16:00						16:00
Vol.	1	262	35	3	5	1		1						289



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04/11/1														
8	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	5	1	0	0	0	0	0	0	0	0	0	0	6
05:00	0	16	8	0	0	0	0	0	0	0	0	0	0	24
06:00	0	156	26	0	2	0	0	0	0	0	0	0	0	184
07:00	0	278	37	1	5	0	0	0	0	0	0	0	0	321
08:00	0	252	32	0	4	3	0	0	0	0	0	0	0	291
09:00	1	161	30	1	5	0	0	0	0	0	0	0	0	198
10:00	0	88	14	1	0	0	0	0	0	0	0	0	0	103
11:00	0	76	18	1	3	0	0	0	0	0	0	0	0	98
12 PM	0	102	23	3	1	0	0	1	0	0	0	0	0	130
13:00	0	85	15	2	1	1	0	0	0	0	0	0	0	104
14:00	0	130	19	3	1	1	0	1	0	0	0	0	0	155
15:00	0	220	43	2	4	0	0	0	0	0	0	0	0	269
16:00	0	276	27	1	1	1	0	0	0	0	0	0	0	306
17:00	0	268	19	0	3	0	0	0	0	0	0	0	0	290
18:00	0	119	10	0	3	0	0	0	0	0	0	0	0	132
19:00	0	54	3	0	0	0	0	0	0	0	0	0	0	57
20:00	0	26	5	0	0	0	0	0	0	0	0	0	0	31
21:00	0	20	0	0	0	0	0	0	0	0	0	0	0	20
22:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
23:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
Total	1	2352	331	15	33	6	0	2	0	0	0	0	0	2740
Percent	0.0%	85.8%	12.1%	0.5%	1.2%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	07:00	07:00	07:00	08:00								07:00
Vol.	1	278	37	1	5	3								321
PM Peak		16:00	15:00	12:00	15:00	13:00		12:00						16:00
Vol.		276	43	3	4	1		1						306



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Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	0	2	1	0	0	0	0	0	0	0	3	36	34
01:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
02:00	0	0	0	0	0	0	1	1	0	0	0	0	0	2	47	45
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	0	0	1	0	1	0	0	0	0	0	0	2	42	37
05:00	0	0	0	1	3	7	5	0	0	0	0	0	0	16	41	37
06:00	0	0	0	6	19	25	13	4	0	0	0	0	0	67	41	36
07:00	0	0	0	5	28	80	33	5	0	0	0	0	0	151	41	37
08:00	0	0	0	7	49	99	39	6	0	0	0	0	0	200	40	37
09:00	1	0	1	4	35	59	18	1	0	0	0	0	0	119	39	36
10:00	0	0	0	6	20	22	10	2	0	0	0	0	0	60	40	35
11:00	0	0	0	1	16	26	22	0	0	0	0	0	0	65	41	37
12 PM	0	0	1	0	16	42	16	4	2	0	0	0	0	81	42	38
13:00	0	0	0	2	15	32	15	2	0	0	0	0	0	66	41	37
14:00	1	0	0	1	13	46	21	3	0	0	0	0	0	85	41	37
15:00	0	0	0	5	33	59	26	2	0	1	0	0	0	126	40	37
16:00	1	0	0	4	25	79	24	1	0	0	0	0	0	134	40	37
17:00	0	0	0	2	26	67	25	3	0	0	0	0	0	123	40	37
18:00	0	0	0	1	24	40	17	1	0	0	0	0	0	83	40	37
19:00	0	0	0	0	17	23	12	1	1	0	0	0	0	54	41	37
20:00	0	0	0	4	11	13	6	1	0	0	0	0	0	35	40	35
21:00	0	0	0	2	4	8	4	0	1	0	0	0	0	19	41	37
22:00	0	0	0	0	4	4	1	0	0	0	0	0	0	9	38	35
23:00	0	0	0	1	3	3	1	1	0	0	0	0	0	9	42	36
Total	3	0	2	52	365	736	310	38	4	1	0	0	0	1511		
%	0.2%	0.0%	0.1%	3.4%	24.2%	48.7%	20.5%	2.5%	0.3%	0.1%	0.0%	0.0%	0.0%			
AM Peak	09:00		09:00	08:00	08:00	08:00	08:00	08:00						08:00		
Vol.	1		1	7	49	99	39	6						200		
PM Peak	14:00		12:00	15:00	15:00	16:00	15:00	12:00	12:00	15:00				16:00		
Vol.	1		1	5	33	79	26	4	2	1				134		

Stats

15th Percentile : 31 MPH
50th Percentile : 36 MPH
85th Percentile : 41 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 37 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1101
Percent in Pace : 72.9%
Number of Vehicles > 35 MPH : 942
Percent of Vehicles > 35 MPH : 62.3%



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Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	0	0	2	1	2	0	0	0	0	0	5	47	42
01:00	0	0	0	1	0	0	1	0	1	0	0	0	0	3	51	40
02:00	0	0	0	0	0	0	2	0	0	0	0	0	0	2	43	42
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	0	0	1	1	2	0	0	0	0	0	0	4	42	38
05:00	0	0	0	1	4	8	3	1	0	0	0	0	0	17	41	37
06:00	0	0	1	5	12	17	9	4	1	0	0	0	0	49	42	36
07:00	0	0	0	2	46	94	23	4	0	0	0	0	0	169	39	36
08:00	1	0	0	3	45	81	28	5	0	0	0	0	0	163	40	36
09:00	1	3	1	6	26	50	19	0	0	0	0	0	0	106	39	35
10:00	1	0	0	1	19	32	12	1	0	0	0	0	0	66	40	36
11:00	0	0	0	2	22	23	11	0	0	0	0	0	0	58	40	36
12 PM	0	0	1	5	34	34	7	2	0	0	0	0	0	83	38	35
13:00	0	0	0	5	15	37	9	1	0	0	0	0	0	67	38	36
14:00	0	0	0	5	43	43	18	0	0	0	0	0	0	109	39	35
15:00	0	3	1	7	56	73	10	0	0	0	0	0	0	150	38	34
16:00	0	0	0	10	37	50	15	1	0	0	0	0	0	113	38	35
17:00	0	0	0	6	30	58	17	3	0	0	0	0	0	114	39	36
18:00	1	0	0	2	16	42	19	2	0	0	0	0	0	82	41	37
19:00	1	0	0	2	11	18	2	1	0	0	0	0	0	35	38	35
20:00	0	0	0	0	7	13	5	1	0	0	0	0	0	26	41	37
21:00	0	0	1	2	13	7	1	0	0	0	0	0	0	24	37	33
22:00	0	0	0	1	10	5	1	0	0	0	0	0	0	17	37	34
23:00	0	0	0	0	2	7	0	0	0	0	0	0	0	9	38	36
Total	5	6	5	66	449	696	215	28	2	0	0	0	0	1472		
%	0.3%	0.4%	0.3%	4.5%	30.5%	47.3%	14.6%	1.9%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	06:00	09:00	07:00	07:00	08:00	08:00	01:00					07:00		
Vol.	1	3	1	6	46	94	28	5	1					169		
PM Peak	18:00	15:00	12:00	16:00	15:00	15:00	18:00	17:00						15:00		
Vol.	1	3	1	10	56	73	19	3						150		

Stats

15th Percentile :	30 MPH
50th Percentile :	35 MPH
85th Percentile :	39 MPH
95th Percentile :	42 MPH
Mean Speed(Average) :	36 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	1145
Percent in Pace :	77.8%
Number of Vehicles > 35 MPH :	802
Percent of Vehicles > 35 MPH :	54.5%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

165-183 Bedford Road
south of Route 2A

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/																
18	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
01:00	0	0	0	0	1	2	1	0	0	0	0	0	0	4	41	37
02:00	0	0	1	1	0	1	2	0	0	0	0	0	0	5	42	34
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	0	0	0	1	3	4	2	0	0	0	0	0	0	10	40	36
07:00	0	0	0	1	11	9	7	0	0	0	0	0	0	28	41	36
08:00	0	0	0	3	26	22	9	0	0	0	0	0	0	60	38	35
09:00	0	0	0	3	34	31	8	2	0	0	0	0	0	78	38	35
10:00	0	0	1	15	50	58	10	1	0	0	0	0	0	135	38	34
11:00	0	0	0	5	57	49	19	0	0	0	0	0	0	130	38	35
12 PM	0	0	0	3	34	62	20	4	1	0	0	0	0	124	40	37
13:00	0	0	0	2	37	67	23	1	0	0	0	0	0	130	39	36
14:00	0	0	0	2	44	58	23	2	1	0	0	0	0	130	40	36
15:00	0	0	0	7	34	46	12	2	0	0	0	0	0	101	38	35
16:00	0	0	0	1	11	37	13	1	0	0	0	0	0	63	40	37
17:00	0	0	0	3	14	24	12	1	0	0	0	0	0	54	41	36
18:00	0	0	0	0	12	18	7	7	0	0	0	0	0	44	44	38
19:00	0	0	0	2	4	14	6	0	0	0	0	0	0	26	40	37
20:00	0	0	0	0	5	9	3	1	0	0	0	0	0	18	41	37
21:00	0	0	0	0	4	3	6	1	0	0	0	0	0	14	43	38
22:00	0	0	0	1	5	11	3	0	0	0	0	0	0	20	39	36
23:00	0	0	0	0	8	7	2	0	0	0	0	0	0	17	38	35
Total	0	0	2	51	396	532	188	23	2	0	0	0	0	1194		
%	0.0%	0.0%	0.2%	4.3%	33.2%	44.6%	15.7%	1.9%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak			02:00	10:00	11:00	10:00	11:00	09:00						10:00		
Vol.			1	15	57	58	19	2						135		
PM Peak				15:00	14:00	13:00	13:00	18:00	12:00					13:00		
Vol.				7	44	67	23	7	1					130		

Stats

15th Percentile : 30 MPH

50th Percentile : 35 MPH

85th Percentile : 39 MPH

95th Percentile : 43 MPH

Mean Speed(Average) : 36 MPH

10 MPH Pace Speed : 30-39 MPH

Number in Pace : 928

Percent in Pace : 77.7%

Number of Vehicles > 35 MPH : 639

Percent of Vehicles > 35 MPH : 53.5%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
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165-183 Bedford Road
south of Route 2A

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	2	3	1	0	0	0	0	0	0	6	39	36
01:00	0	0	0	0	0	1	1	0	0	0	0	0	0	2	42	40
02:00	0	0	0	0	0	0	2	0	0	0	0	0	0	2	43	42
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1	48	47
05:00	0	0	0	0	1	1	1	0	0	0	0	0	0	3	41	37
06:00	0	0	0	0	0	4	1	0	0	0	0	0	0	5	40	38
07:00	1	0	0	0	2	4	3	1	0	0	0	0	0	11	42	36
08:00	0	0	1	2	6	5	5	1	0	0	0	0	0	20	42	35
09:00	0	1	0	3	5	14	5	0	0	0	0	0	0	28	39	35
10:00	0	0	1	3	16	21	11	2	0	0	0	0	0	54	41	36
11:00	0	0	0	4	17	30	11	1	0	0	0	0	0	63	40	36
12 PM	0	0	0	1	17	37	10	4	1	0	0	0	0	70	41	37
13:00	0	0	0	0	15	36	13	3	1	0	0	0	0	68	41	38
14:00	0	0	0	1	14	34	20	1	0	0	0	0	0	70	41	37
15:00	0	0	0	1	17	20	14	1	0	0	0	0	0	53	41	37
16:00	0	0	1	1	13	36	7	1	1	0	0	0	0	60	39	36
17:00	0	0	0	2	11	26	9	2	0	0	0	0	0	50	40	37
18:00	0	0	0	1	7	13	6	3	0	0	0	0	0	30	42	37
19:00	0	0	0	4	10	13	6	0	0	0	0	0	0	33	39	35
20:00	0	0	0	0	6	8	5	0	0	0	0	0	0	19	41	37
21:00	0	0	0	0	5	4	3	1	0	0	0	0	0	13	42	37
22:00	0	0	0	1	2	2	2	0	0	0	0	0	0	7	41	36
23:00	0	0	0	0	2	0	3	0	0	0	0	0	0	5	42	38
Total	1	1	3	24	168	312	139	22	3	0	0	0	0	673		
%	0.1%	0.1%	0.4%	3.6%	25.0%	46.4%	20.7%	3.3%	0.4%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	09:00	08:00	11:00	11:00	11:00	10:00	10:00						11:00		
Vol.	1	1	1	4	17	30	11	2						63		
PM Peak			16:00	19:00	12:00	12:00	14:00	12:00	12:00					12:00		
Vol.			1	4	17	37	20	4	1					70		

Stats

15th Percentile : 31 MPH
50th Percentile : 36 MPH
85th Percentile : 41 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 37 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 480
Percent in Pace : 71.3%
Number of Vehicles > 35 MPH : 414
Percent of Vehicles > 35 MPH : 61.5%



PRECISION
D A T A
INDUSTRIES, LLC

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165-183 Bedford Road
south of Route 2A

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	0	2	0	2	0	0	0	0	0	4	47	42
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	38	37
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	1	1	0	0	0	0	0	0	2	42	40
05:00	0	0	0	1	9	10	2	1	0	0	0	0	0	23	38	35
06:00	0	0	0	7	9	23	16	2	0	1	0	0	0	58	42	37
07:00	2	0	0	8	52	104	26	2	0	0	0	0	0	194	38	36
08:00	0	0	0	6	55	109	26	3	0	0	0	0	0	199	38	36
09:00	0	0	1	4	26	45	26	0	0	0	0	0	0	102	41	36
10:00	0	0	0	3	14	29	11	1	0	0	0	0	0	58	40	36
11:00	0	0	0	1	19	22	10	2	2	0	0	0	0	56	41	37
12 PM	0	0	0	0	27	44	10	0	0	0	0	0	0	81	38	36
13:00	2	0	0	1	9	32	17	1	1	0	0	0	0	63	41	37
14:00	0	0	0	2	29	35	11	0	0	0	0	0	0	77	38	36
15:00	0	0	0	2	13	55	21	2	0	0	0	0	0	93	41	37
16:00	0	0	0	2	32	68	24	4	1	0	0	0	0	131	40	37
17:00	0	0	0	0	24	74	22	2	1	0	0	0	0	123	40	37
18:00	0	0	0	0	17	53	15	3	0	0	0	0	0	88	40	37
19:00	0	0	0	1	14	28	7	1	0	0	0	0	0	51	39	36
20:00	0	0	0	2	9	7	4	0	0	0	0	0	0	22	39	35
21:00	0	0	1	0	4	4	5	1	0	0	0	0	0	15	42	37
22:00	0	0	0	1	2	5	2	1	0	0	0	0	0	11	42	37
23:00	0	0	0	0	1	2	1	0	1	0	0	0	0	5	50	40
Total	4	0	2	41	365	754	257	28	6	1	0	0	0	1458		
%	0.3%	0.0%	0.1%	2.8%	25.0%	51.7%	17.6%	1.9%	0.4%	0.1%	0.0%	0.0%	0.0%			
AM Peak	07:00		09:00	07:00	08:00	08:00	07:00	08:00	11:00	06:00				08:00		
Vol.	2		1	8	55	109	26	3	2	1				199		
PM Peak	13:00		21:00	14:00	16:00	17:00	16:00	16:00	13:00					16:00		
Vol.	2		1	2	32	74	24	4	1					131		

Stats

15th Percentile : 31 MPH
50th Percentile : 36 MPH
85th Percentile : 40 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 37 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1119
Percent in Pace : 76.7%
Number of Vehicles > 35 MPH : 895
Percent of Vehicles > 35 MPH : 61.4%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

165-183 Bedford Road
south of Route 2A

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	0	0	5	2	0	0	0	0	0	0	7	41	38
01:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
02:00	0	0	0	0	1	0	1	0	0	0	0	0	0	2	42	37
03:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
04:00	0	0	0	0	2	0	0	1	0	0	0	0	0	3	46	37
05:00	0	0	0	1	5	4	6	2	0	0	0	0	0	18	43	38
06:00	0	0	0	2	27	36	12	1	0	0	0	0	0	78	39	36
07:00	0	0	0	13	55	84	28	0	0	0	0	0	0	180	39	36
08:00	0	0	2	19	73	85	20	0	0	0	0	0	0	199	38	35
09:00	0	0	0	1	43	56	22	0	0	0	0	0	0	122	39	36
10:00	0	0	0	5	19	27	11	0	0	0	0	0	0	62	39	36
11:00	0	0	0	3	22	32	9	1	0	0	0	0	0	67	38	36
12 PM	0	0	0	11	26	30	10	2	0	0	0	0	0	79	39	35
13:00	0	0	0	2	23	31	7	0	0	0	0	0	0	63	38	35
14:00	0	0	0	1	21	37	15	1	0	0	0	0	0	75	40	37
15:00	0	0	0	6	36	65	20	3	0	0	0	0	0	130	39	36
16:00	0	0	0	0	29	80	28	0	0	0	0	0	0	137	40	37
17:00	0	0	0	3	33	52	25	5	0	0	0	0	0	118	41	37
18:00	0	0	0	1	22	44	24	2	0	0	0	0	0	93	41	37
19:00	1	0	0	2	10	22	8	3	0	0	0	0	0	46	41	36
20:00	0	0	0	1	9	5	3	1	0	0	0	0	0	19	40	35
21:00	0	0	0	0	7	7	1	0	0	0	0	0	0	15	38	35
22:00	0	0	0	2	6	6	0	1	0	0	0	0	0	15	37	34
23:00	0	0	0	0	0	6	0	1	0	0	0	0	0	7	38	38
Total	1	0	2	74	471	714	252	24	0	0	0	0	0	1538		
%	0.1%	0.0%	0.1%	4.8%	30.6%	46.4%	16.4%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak			08:00	08:00	08:00	08:00	07:00	05:00						08:00		
Vol.			2	19	73	85	28	2						199		
PM Peak	19:00			12:00	15:00	16:00	16:00	17:00						16:00		
Vol.	1			11	36	80	28	5						137		

Stats

15th Percentile : 30 MPH
50th Percentile : 35 MPH
85th Percentile : 39 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1185
Percent in Pace : 77.0%
Number of Vehicles > 35 MPH : 847
Percent of Vehicles > 35 MPH : 55.1%



PRECISION
D A T A
INDUSTRIES, LLC

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165-183 Bedford Road
south of Route 2A

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	0	2	1	0	0	0	0	0	0	0	3	36	34
01:00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	43	42
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
04:00	0	0	0	0	0	1	2	0	0	0	0	0	0	3	42	40
05:00	0	0	0	2	3	8	3	2	0	0	0	0	0	18	42	37
06:00	0	0	0	2	13	37	17	2	0	0	0	0	0	71	41	37
07:00	1	0	2	7	61	96	19	1	0	0	0	0	0	187	38	35
08:00	0	0	0	6	49	88	30	1	0	0	0	0	0	174	39	36
09:00	0	0	0	13	76	70	10	2	0	0	0	0	0	171	38	34
10:00	0	0	0	6	37	48	10	2	0	0	0	0	0	103	38	35
11:00	0	0	1	4	33	46	10	1	1	0	0	0	0	96	38	35
12 PM	0	0	0	1	53	69	17	0	0	0	0	0	0	140	38	36
13:00	0	0	0	0	38	52	12	2	0	0	0	0	0	104	38	36
14:00	1	0	0	4	37	63	15	1	0	0	0	0	0	121	38	36
15:00	0	0	1	12	30	73	18	1	0	0	0	0	0	135	38	36
16:00	0	0	0	3	30	60	23	2	0	0	0	0	0	118	40	37
17:00	0	0	0	7	38	58	8	2	0	0	0	0	0	113	38	35
18:00	0	0	0	1	28	38	27	2	0	0	0	0	0	96	41	37
19:00	0	0	0	1	18	20	13	3	0	0	0	0	0	55	41	37
20:00	0	0	0	2	3	13	8	0	0	0	0	0	0	26	41	37
21:00	0	0	1	1	4	12	5	1	0	0	0	0	0	24	41	37
22:00	0	0	0	2	4	4	1	0	0	0	0	0	0	11	38	34
23:00	0	0	0	0	1	3	0	0	0	0	0	0	0	4	38	36
Total	2	0	5	74	559	860	249	25	1	0	0	0	0	1775		
%	0.1%	0.0%	0.3%	4.2%	31.5%	48.5%	14.0%	1.4%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00		07:00	09:00	09:00	07:00	08:00	05:00	11:00					07:00		
Vol.	1		2	13	76	96	30	2	1					187		
PM Peak	14:00		15:00	15:00	12:00	15:00	18:00	19:00						12:00		
Vol.	1		1	12	53	73	27	3						140		

Stats

15th Percentile : 30 MPH
50th Percentile : 35 MPH
85th Percentile : 39 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1419
Percent in Pace : 79.9%
Number of Vehicles > 35 MPH : 963
Percent of Vehicles > 35 MPH : 54.3%



PRECISION
D A T A
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SB

176038 B Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	1	1	2	0	0	0	0	0	0	0	4	37	33
01:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
03:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
04:00	0	0	1	0	2	1	0	0	0	0	0	0	0	4	36	31
05:00	0	0	0	1	8	6	5	1	0	0	0	0	0	21	41	36
06:00	0	0	1	5	34	106	26	2	0	0	0	0	0	174	39	37
07:00	1	0	0	8	84	179	49	4	1	0	0	0	0	326	39	36
08:00	0	0	0	8	77	193	44	3	1	0	0	0	0	326	38	36
09:00	1	0	1	11	70	109	39	3	0	0	0	0	0	234	39	36
10:00	0	0	0	5	26	37	9	1	0	0	0	0	0	78	38	35
11:00	1	0	0	4	33	28	6	0	0	0	0	0	0	72	38	34
12 PM	0	0	1	10	39	30	7	1	0	0	0	0	0	88	38	34
13:00	0	1	0	4	27	30	10	0	0	0	0	0	0	72	38	35
14:00	0	0	2	5	34	54	15	0	0	0	0	0	0	110	38	35
15:00	0	0	0	5	116	152	38	4	0	0	1	0	0	316	38	36
16:00	0	1	0	10	89	169	24	7	0	0	0	0	0	300	38	36
17:00	1	0	0	6	96	195	48	4	0	1	0	0	0	351	39	36
18:00	1	0	2	6	41	52	15	0	0	0	0	0	0	117	38	35
19:00	0	0	1	1	30	15	4	0	1	0	0	0	0	52	38	34
20:00	0	0	0	2	18	11	1	0	0	0	0	0	0	32	37	34
21:00	0	0	0	1	6	6	2	0	0	0	0	0	0	15	38	35
22:00	0	0	0	0	1	4	1	1	0	0	0	0	0	7	43	38
23:00	0	0	0	2	3	2	2	0	0	0	0	0	0	9	40	34
Total	5	2	9	96	837	1382	345	31	3	1	1	0	0	2712		
%	0.2%	0.1%	0.3%	3.5%	30.9%	51.0%	12.7%	1.1%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00		04:00	09:00	07:00	08:00	07:00	07:00	07:00					07:00		
Vol.	1		1	11	84	193	49	4	1					326		
PM Peak	17:00	13:00	14:00	12:00	15:00	17:00	17:00	16:00	19:00	17:00	15:00			17:00		
Vol.	1	1	2	10	116	195	48	7	1	1	1			351		

Stats

15th Percentile :	30 MPH
50th Percentile :	35 MPH
85th Percentile :	38 MPH
95th Percentile :	42 MPH
Mean Speed(Average) :	36 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	2219
Percent in Pace :	81.8%
Number of Vehicles > 35 MPH :	1487
Percent of Vehicles > 35 MPH :	54.8%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
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165-183 Bedford Road
south of Route 2A

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Speed

Site Code: TBA

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	0	0	0	2	0	1	0	0	0	0	3	51	45
01:00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	43	42
02:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1	48	47
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	1	0	1	1	0	0	0	0	0	0	0	3	36	30
05:00	0	0	1	3	4	10	4	1	0	0	0	0	0	23	40	35
06:00	0	0	0	3	25	68	26	4	0	0	0	0	0	126	41	37
07:00	0	1	1	11	52	120	40	5	0	0	0	0	0	230	40	36
08:00	0	0	2	4	77	107	30	2	0	0	0	0	0	222	38	36
09:00	0	0	4	8	40	37	15	1	1	0	0	0	0	106	39	35
10:00	0	1	0	2	33	28	5	3	0	0	0	0	0	72	38	35
11:00	0	0	1	9	32	40	7	0	0	0	0	0	0	89	38	34
12 PM	0	1	1	4	28	27	12	0	0	0	0	0	0	73	39	35
13:00	0	0	1	3	21	29	7	0	0	0	0	0	0	61	38	35
14:00	1	0	1	18	63	81	17	1	0	0	0	0	0	182	38	35
15:00	0	0	2	32	120	126	27	1	0	0	0	0	0	308	38	34
16:00	1	0	1	27	150	159	25	2	1	0	0	0	0	366	38	35
17:00	0	1	0	8	81	117	20	1	0	0	0	0	0	228	38	35
18:00	0	0	1	2	34	49	11	1	1	0	0	0	0	99	38	36
19:00	1	0	1	3	17	23	1	0	0	0	0	0	0	46	37	34
20:00	0	0	0	2	12	9	3	0	1	0	0	0	0	27	38	35
21:00	0	0	0	1	10	11	1	0	0	0	0	0	0	23	37	35
22:00	0	0	0	5	6	7	0	1	0	0	0	0	0	19	37	33
23:00	0	0	1	0	3	2	0	0	0	0	0	0	0	6	36	32
Total	3	4	19	145	809	1052	254	24	5	0	0	0	0	2315		
%	0.1%	0.2%	0.8%	6.3%	34.9%	45.4%	11.0%	1.0%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak		07:00	09:00	07:00	08:00	07:00	07:00	07:00	00:00					07:00		
Vol.		1	4	11	77	120	40	5	1					230		
PM Peak	14:00	12:00	15:00	15:00	16:00	16:00	15:00	16:00	16:00					16:00		
Vol.	1	1	2	32	150	159	27	2	1					366		

Stats

15th Percentile : 30 MPH
50th Percentile : 34 MPH
85th Percentile : 38 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1861
Percent in Pace : 80.4%
Number of Vehicles > 35 MPH : 1125
Percent of Vehicles > 35 MPH : 48.6%



PRECISION
D A T A
INDUSTRIES, LLC

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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 B Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/ 18	0	0	0	0	1	2	0	0	0	0	0	0	0	3	37	35
01:00	1	0	0	0	1	1	0	0	0	0	0	0	0	3	36	26
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
05:00	0	0	0	0	1	1	1	1	0	0	0	0	0	4	46	39
06:00	0	1	0	0	6	3	1	0	0	0	0	0	0	11	37	33
07:00	0	0	0	0	7	17	4	1	0	0	0	0	0	29	39	37
08:00	0	0	1	3	13	24	7	0	0	0	0	0	0	48	38	35
09:00	0	0	1	13	36	31	8	1	0	0	0	0	0	90	38	34
10:00	0	0	0	12	46	35	9	0	0	0	0	0	0	102	38	34
11:00	0	0	2	11	37	34	10	0	0	0	0	0	0	94	38	34
12 PM	0	1	1	10	46	51	7	0	0	0	0	0	0	116	37	34
13:00	1	0	1	12	55	47	7	2	1	0	0	0	0	126	38	34
14:00	0	0	0	9	40	37	5	1	0	0	0	0	0	92	37	34
15:00	0	0	0	11	49	47	6	1	0	0	0	0	0	114	37	34
16:00	0	0	0	10	37	40	4	1	0	0	0	0	0	92	37	34
17:00	0	1	2	2	24	28	4	1	0	0	0	0	0	62	38	34
18:00	0	0	1	3	16	28	7	0	0	0	0	0	0	55	38	35
19:00	0	0	0	2	16	17	4	0	0	0	0	0	0	39	38	35
20:00	0	0	0	4	4	8	4	0	1	0	0	0	0	21	41	36
21:00	0	0	0	3	8	9	3	0	0	0	0	0	0	23	38	35
22:00	0	0	0	2	8	7	3	0	0	0	0	0	0	20	39	35
23:00	0	0	0	0	3	6	2	0	0	0	0	0	0	11	39	37
Total	2	3	9	107	455	475	96	9	2	0	0	0	0	1158		
%	0.2%	0.3%	0.8%	9.2%	39.3%	41.0%	8.3%	0.8%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak	01:00	06:00	11:00	09:00	10:00	10:00	11:00	05:00						10:00		
Vol.	1	1	2	13	46	35	10	1						102		
PM Peak	13:00	12:00	17:00	13:00	13:00	12:00	12:00	13:00	13:00					13:00		
Vol.	1	1	2	12	55	51	7	2	1					126		

Stats

15th Percentile :	29 MPH
50th Percentile :	34 MPH
85th Percentile :	38 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	930
Percent in Pace :	80.3%
Number of Vehicles > 35 MPH :	487
Percent of Vehicles > 35 MPH :	42.1%



PRECISION
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165-183 Bedford Road
south of Route 2A

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Speed

Site Code: TBA

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
01:00	0	0	0	0	2	0	0	0	0	0	0	0	0	2	33	32
02:00	0	0	0	0	0	0	0	0	1	0	0	0	0	1	53	52
03:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1	48	47
04:00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	43	42
05:00	0	0	0	1	2	1	1	1	0	0	0	0	0	6	44	36
06:00	0	0	1	1	2	1	0	0	0	0	0	0	0	5	35	30
07:00	0	0	0	0	1	4	1	0	0	0	0	0	0	6	39	37
08:00	0	0	0	1	9	17	3	0	0	0	0	0	0	30	38	36
09:00	0	1	0	0	13	17	5	1	0	0	0	0	0	37	39	36
10:00	0	0	0	6	21	23	5	1	0	0	0	0	0	56	38	35
11:00	0	0	1	4	14	26	2	0	0	0	0	0	0	47	38	35
12 PM	1	0	2	9	36	26	12	2	0	0	0	0	0	88	39	34
13:00	0	0	0	7	36	37	10	0	0	0	0	0	0	90	38	35
14:00	0	0	0	9	21	20	6	0	0	0	0	0	0	56	38	34
15:00	0	0	1	5	23	22	5	0	0	0	0	0	0	56	38	34
16:00	0	0	0	0	22	25	3	0	0	0	0	0	0	50	38	35
17:00	0	1	0	9	19	23	1	0	0	0	0	0	0	53	37	33
18:00	0	0	0	3	14	19	6	0	0	0	0	0	0	42	38	35
19:00	1	0	0	5	5	7	1	0	0	0	0	0	0	19	37	32
20:00	0	0	0	3	6	6	3	0	1	0	0	0	0	19	40	35
21:00	0	0	0	0	3	4	2	0	0	0	0	0	0	9	40	36
22:00	0	0	0	1	2	2	1	0	0	0	0	0	0	6	39	35
23:00	0	0	0	2	0	3	1	0	0	0	0	0	0	6	39	35
Total	2	2	5	66	251	284	69	6	2	0	0	0	0	687		
%	0.3%	0.3%	0.7%	9.6%	36.5%	41.3%	10.0%	0.9%	0.3%	0.0%	0.0%	0.0%	0.0%			
AM Peak		09:00	06:00	10:00	10:00	11:00	09:00	03:00	02:00					10:00		
Vol.		1	1	6	21	26	5	1	1					56		
PM Peak	12:00	17:00	12:00	12:00	12:00	13:00	12:00	12:00	20:00					13:00		
Vol.	1	1	2	9	36	37	12	2	1					90		

Stats

15th Percentile : 29 MPH
50th Percentile : 34 MPH
85th Percentile : 38 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 535
Percent in Pace : 77.9%
Number of Vehicles > 35 MPH : 304
Percent of Vehicles > 35 MPH : 44.3%



PRECISION
D A T A
INDUSTRIES, LLC

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165-183 Bedford Road
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City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 B Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	0	0	2	0	0	0	0	0	0	2	43	42
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
03:00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	43	42
04:00	0	0	1	0	1	3	0	0	0	0	0	0	0	5	37	33
05:00	0	0	1	1	12	10	4	2	0	0	0	0	0	30	40	36
06:00	0	0	0	1	44	85	37	7	0	0	0	0	0	174	41	37
07:00	3	6	0	3	78	177	44	2	0	0	0	0	0	313	38	36
08:00	0	0	0	5	97	186	48	6	0	0	0	0	0	342	39	36
09:00	0	0	0	6	35	85	32	5	0	0	0	0	0	163	40	37
10:00	0	0	1	7	20	28	2	0	0	0	0	0	0	58	37	34
11:00	0	0	3	12	25	19	0	2	0	0	0	0	0	61	37	33
12 PM	1	0	0	5	33	23	5	1	0	0	0	0	0	68	38	34
13:00	0	0	0	4	22	27	6	2	0	0	0	0	0	61	38	35
14:00	0	0	1	8	41	38	11	1	0	0	0	0	0	100	38	35
15:00	0	0	0	8	48	97	19	0	0	0	0	0	0	172	38	36
16:00	0	1	0	9	94	137	45	2	1	0	0	0	0	289	39	36
17:00	0	1	0	8	69	139	31	1	0	0	0	0	0	249	38	36
18:00	0	1	0	4	44	51	20	3	0	0	0	0	0	123	40	36
19:00	1	0	0	4	12	17	3	0	0	0	0	0	0	37	38	34
20:00	0	0	0	0	15	13	5	1	1	0	0	0	0	35	40	36
21:00	0	0	0	1	6	9	5	1	0	0	0	0	0	22	41	37
22:00	0	0	0	0	4	1	2	0	0	0	0	0	0	7	41	36
23:00	0	0	0	0	6	2	0	0	0	0	0	0	0	8	36	33
Total	5	9	7	87	706	1147	322	36	2	0	0	0	0	2321		
%	0.2%	0.4%	0.3%	3.7%	30.4%	49.4%	13.9%	1.6%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	07:00	11:00	11:00	08:00	08:00	08:00	06:00						08:00		
Vol.	3	6	3	12	97	186	48	7						342		
PM Peak	12:00	16:00	14:00	16:00	16:00	17:00	16:00	18:00	16:00					16:00		
Vol.	1	1	1	9	94	139	45	3	1					289		

Stats

15th Percentile :	30 MPH
50th Percentile :	35 MPH
85th Percentile :	39 MPH
95th Percentile :	42 MPH
Mean Speed(Average) :	36 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	1853
Percent in Pace :	79.8%
Number of Vehicles > 35 MPH :	1278
Percent of Vehicles > 35 MPH :	55.0%



PRECISION
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SB

176038 B Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	0	2	0	0	0	0	0	0	0	0	2	33	32
01:00	0	0	1	1	0	0	0	1	0	0	0	0	0	3	46	32
02:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	1	0	0	2	2	0	0	0	0	0	0	0	5	37	31
05:00	0	0	0	2	11	10	7	1	0	0	0	0	0	31	41	36
06:00	0	0	0	4	44	105	40	3	0	0	0	0	0	196	40	37
07:00	0	0	0	9	76	176	52	12	0	0	0	0	0	325	40	37
08:00	0	0	3	9	83	153	31	5	2	0	0	0	0	286	38	36
09:00	0	0	1	12	58	93	23	2	0	0	0	0	0	189	38	35
10:00	1	1	0	7	22	35	13	1	0	0	0	0	0	80	39	35
11:00	0	0	1	3	29	31	4	0	0	0	0	0	0	68	38	34
12 PM	0	0	0	3	24	32	9	1	1	0	0	0	0	70	39	36
13:00	0	1	0	4	20	25	7	1	0	0	0	0	0	58	38	35
14:00	1	0	1	5	44	45	17	0	0	0	0	0	0	113	39	35
15:00	0	0	0	6	72	131	42	4	1	0	0	0	0	256	40	36
16:00	0	0	1	30	148	165	46	3	0	0	0	0	0	393	38	35
17:00	0	0	0	1	75	142	39	0	0	1	0	0	0	258	39	36
18:00	0	0	1	3	34	57	27	1	0	0	0	0	0	123	40	36
19:00	1	0	0	6	19	20	6	0	0	0	0	0	0	52	38	34
20:00	0	0	0	3	15	7	2	1	0	0	0	0	0	28	38	34
21:00	0	0	0	0	6	2	0	0	0	0	0	0	0	8	36	33
22:00	0	0	0	2	1	2	0	0	0	0	0	0	0	5	37	32
23:00	0	0	0	0	2	2	0	0	0	0	0	0	0	4	37	35
Total	3	3	9	111	788	1235	365	36	4	1	0	0	0	2555		
%	0.1%	0.1%	0.4%	4.3%	30.8%	48.3%	14.3%	1.4%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	04:00	08:00	09:00	08:00	07:00	07:00	07:00	08:00					07:00		
Vol.	1	1	3	12	83	176	52	12	2					325		
PM Peak	14:00	13:00	14:00	16:00	16:00	16:00	16:00	15:00	12:00	17:00				16:00		
Vol.	1	1	1	30	148	165	46	4	1	1				393		

Stats

15th Percentile : 30 MPH
50th Percentile : 35 MPH
85th Percentile : 39 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2023
Percent in Pace : 79.2%
Number of Vehicles > 35 MPH : 1394
Percent of Vehicles > 35 MPH : 54.6%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 B Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	0	2	1	0	0	0	0	0	0	0	3	36	34
01:00	0	0	0	1	1	2	0	0	0	0	0	0	0	4	37	33
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
04:00	0	0	0	2	2	2	0	0	0	0	0	0	0	6	36	32
05:00	0	0	1	2	9	7	4	1	0	0	0	0	0	24	40	35
06:00	0	0	0	3	44	99	35	3	0	0	0	0	0	184	40	37
07:00	0	0	0	13	104	162	39	3	0	0	0	0	0	321	38	36
08:00	0	0	2	13	87	157	28	3	1	0	0	0	0	291	38	36
09:00	0	0	1	5	71	98	19	4	0	0	0	0	0	198	38	36
10:00	0	0	1	10	53	30	8	1	0	0	0	0	0	103	37	34
11:00	0	0	2	8	48	34	5	1	0	0	0	0	0	98	37	34
12 PM	0	1	3	10	49	53	13	0	1	0	0	0	0	130	38	34
13:00	0	0	1	8	33	48	13	1	0	0	0	0	0	104	38	35
14:00	2	0	0	15	60	63	13	2	0	0	0	0	0	155	38	34
15:00	0	0	4	17	89	119	35	3	2	0	0	0	0	269	38	35
16:00	0	0	0	7	98	166	32	3	0	0	0	0	0	306	38	36
17:00	0	0	1	10	114	132	31	2	0	0	0	0	0	290	38	35
18:00	0	0	0	9	46	58	18	0	1	0	0	0	0	132	38	35
19:00	1	0	0	1	22	24	9	0	0	0	0	0	0	57	39	35
20:00	0	0	1	2	11	11	5	1	0	0	0	0	0	31	40	35
21:00	0	0	0	0	5	12	3	0	0	0	0	0	0	20	39	36
22:00	0	0	0	0	2	3	0	0	1	0	0	0	0	6	49	38
23:00	0	0	0	1	2	4	0	0	0	0	0	0	0	7	37	34
Total	3	1	17	138	952	1285	310	28	6	0	0	0	0	2740		
%	0.1%	0.0%	0.6%	5.0%	34.7%	46.9%	11.3%	1.0%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak			08:00	07:00	07:00	07:00	07:00	09:00	08:00					07:00		
Vol.			2	13	104	162	39	4	1					321		
PM Peak	14:00	12:00	15:00	15:00	17:00	16:00	15:00	15:00	15:00					16:00		
Vol.	2	1	4	17	114	166	35	3	2					306		

Stats

15th Percentile : 30 MPH
50th Percentile : 35 MPH
85th Percentile : 38 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2237
Percent in Pace : 81.6%
Number of Vehicles > 35 MPH : 1372
Percent of Vehicles > 35 MPH : 50.1%



PRECISION
D A T A
INDUSTRIES, LLC

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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start	NB				SB				Combined		4/5/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Thu	
12:00	1		20		3		23		4	43		
12:15	0		16		0		28		0	44		
12:30	2		29		1		15		3	44		
12:45	0	3	16	81	0	4	22	88	0	38	169	
01:00	0		19		0		18		0	37		
01:15	0		23		1		24		1	47		
01:30	1		12		1		12		2	24		
01:45	0	1	12	66	0	2	18	72	0	30	138	
02:00	0		15		0		23		0	38		
02:15	1		24		0		16		1	40		
02:30	1		24		1		31		2	55		
02:45	0	2	22	85	0	1	40	110	0	62	195	
03:00	0		35		0		76		0	111		
03:15	0		38		0		60		0	98		
03:30	0		25		1		100		1	125		
03:45	1	1	28	126	0	1	80	316	1	108	442	
04:00	0		27		0		66		0	93		
04:15	0		32		1		80		1	112		
04:30	0		33		0		72		0	105		
04:45	2	2	42	134	3	4	82	300	5	124	434	
05:00	2		26		1		83		3	109		
05:15	1		26		4		98		5	124		
05:30	4		29		9		97		13	126		
05:45	9	16	42	123	7	21	73	351	16	115	474	
06:00	9		32		17		37		26	69		
06:15	17		21		31		41		48	62		
06:30	15		15		52		18		67	33		
06:45	26	67	15	83	74	174	21	117	100	36	200	
07:00	28		19		88		22		116	41		
07:15	42		7		79		17		121	24		
07:30	39		13		87		10		126	23		
07:45	42	151	15	54	72	326	3	52	114	18	106	
08:00	51		10		103		6		154	16		
08:15	42		7		111		13		153	20		
08:30	53		10		57		7		110	17		
08:45	54	200	8	35	55	326	6	32	109	14	67	
09:00	30		5		68		6		98	11		
09:15	29		3		66		3		95	6		
09:30	33		9		58		4		91	13		
09:45	27	119	2	19	42	234	2	15	69	4	34	
10:00	12		2		19		1		31	3		
10:15	18		3		20		2		38	5		
10:30	13		2		24		3		37	5		
10:45	17	60	2	9	15	78	1	7	32	3	16	
11:00	15		3		17		3		32	6		
11:15	12		2		13		3		25	5		
11:30	13		0		23		2		36	2		
11:45	25	65	4	9	19	72	1	9	44	5	18	
Total	687		824		1243		1469		1930	2293		
Percent	35.6%		35.9%		64.4%		64.1%					
Day Total		1511			2712				4223			
Peak	08:00	-	04:00	-	07:30	-	04:45	-	07:30	-	04:45	-
Vol.	200	-	134	-	373	-	360	-	547	-	483	-
P.H.F.	0.926		0.798		0.840		0.918		0.888		0.958	



PRECISION
D A T A
INDUSTRIES, LLC

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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/6/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Fri	
12:00	3		19		1		15		4	34		
12:15	2		21		1		18		3	39		
12:30	0		23		0		21		0	44		
12:45	0	5	20	83	1	3	19	73	1	39	156	
01:00	2		14		0		18		2	32		
01:15	0		16		0		9		0	25		
01:30	0		21		0		16		0	37		
01:45	1	3	16	67	1	1	18	61	2	34	128	
02:00	0		28		0		29		0	57		
02:15	0		29		1		27		1	56		
02:30	1		30		0		51		1	81		
02:45	1	2	22	109	0	1	75	182	1	97	291	
03:00	0		32		0		67		0	99		
03:15	1		57		0		80		1	137		
03:30	0		23		0		86		0	109		
03:45	0	1	38	150	1	1	75	308	1	113	458	
04:00	0		27		0		83		0	110		
04:15	1		21		1		88		2	109		
04:30	0		30		0		98		0	128		
04:45	3	4	35	113	2	3	97	366	5	132	479	
05:00	4		20		2		56		6	76		
05:15	0		25		4		67		4	92		
05:30	3		36		6		63		9	99		
05:45	10	17	33	114	11	23	42	228	21	75	342	
06:00	8		23		16		36		24	59		
06:15	4		20		23		26		27	46		
06:30	15		21		40		25		55	46		
06:45	22	49	18	82	47	126	12	99	69	30	181	
07:00	21		8		71		16		92	24		
07:15	53		8		50		9		103	17		
07:30	42		12		59		14		101	26		
07:45	53	169	7	35	50	230	7	46	103	14	81	
08:00	34		6		54		6		88	12		
08:15	42		6		69		7		111	13		
08:30	35		8		47		5		82	13		
08:45	52	163	6	26	52	222	9	27	104	15	53	
09:00	28		9		32		4		60	13		
09:15	35		7		28		8		63	15		
09:30	26		6		28		2		54	8		
09:45	17	106	2	24	18	106	9	23	35	11	47	
10:00	11		8		27		7		38	15		
10:15	18		4		15		7		33	11		
10:30	18		3		18		1		36	4		
10:45	19	66	2	17	12	72	4	19	31	6	36	
11:00	11		1		12		2		23	3		
11:15	10		0		24		3		34	3		
11:30	18		4		26		1		44	5		
11:45	19	58	4	9	27	89	0	6	46	4	15	
Total	643		829		877		1438		1520	2267		
Percent	42.3%		36.6%		57.7%		63.4%					
Day Total		1472			2315				3787			
Peak	07:15	-	03:00	-	07:30	-	04:00	-	07:30	-	04:00	-
Vol.	182	-	150	-	232	-	366	-	403	-	479	-
P.H.F.	0.858		0.658		0.841		0.934		0.908		0.907	



PRECISION
D A T A
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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/7/2018		
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sat
12:00	0		35		2		29		2		64		
12:15	1		33		1		31		2		64		
12:30	1		24		0		28		1		52		
12:45	0	2	32	124	0	3	28	116	0	5	60	240	
01:00	1		28		0		24		1		52		
01:15	0		31		1		35		1		66		
01:30	1		33		2		30		3		63		
01:45	2	4	38	130	0	3	37	126	2	7	75	256	
02:00	0		31		1		18		1		49		
02:15	0		35		0		18		0		53		
02:30	3		35		0		37		3		72		
02:45	2	5	29	130	0	1	19	92	2	6	48	222	
03:00	0		38		1		20		1		58		
03:15	0		28		0		35		0		63		
03:30	0		18		0		37		0		55		
03:45	0	0	17	101	0	1	22	114	0	1	39	215	
04:00	0		18		1		22		1		40		
04:15	0		15		0		17		0		32		
04:30	1		16		0		27		1		43		
04:45	0	1	14	63	0	1	26	92	0	2	40	155	
05:00	0		12		3		15		3		27		
05:15	0		21		0		14		0		35		
05:30	0		7		1		18		1		25		
05:45	0	0	14	54	0	4	15	62	0	4	29	116	
06:00	2		9		1		15		3		24		
06:15	3		10		1		16		4		26		
06:30	2		12		5		19		7		31		
06:45	3	10	13	44	4	11	5	55	7	21	18	99	
07:00	4		9		5		14		9		23		
07:15	4		3		4		13		8		16		
07:30	12		9		6		6		18		15		
07:45	8	28	5	26	14	29	6	39	22	57	11	65	
08:00	5		4		8		5		13		9		
08:15	16		5		11		5		27		10		
08:30	17		4		16		8		33		12		
08:45	22	60	5	18	13	48	3	21	35	108	8	39	
09:00	22		2		20		8		42		10		
09:15	25		4		22		4		47		8		
09:30	15		4		22		4		37		8		
09:45	16	78	4	14	26	90	7	23	42	168	11	37	
10:00	29		5		21		5		50		10		
10:15	32		6		26		6		58		12		
10:30	38		2		24		7		62		9		
10:45	36	135	7	20	31	102	2	20	67	237	9	40	
11:00	29		8		25		5		54		13		
11:15	23		5		18		4		41		9		
11:30	38		2		23		2		61		4		
11:45	40	130	2	17	28	94	0	11	68	224	2	28	
Total	453		741		387		771		840		1512		
Percent	53.9%		49.0%		46.1%		51.0%						
Day Total			1194			1158				2352			
Peak	10:00	-	01:45	-	10:15	-	01:00	-	10:15	-	01:00	-	-
Vol.	135	-	139	-	106	-	126	-	241	-	256	-	-
P.H.F.	0.888		0.914		0.855		0.851		0.899		0.853		



PRECISION
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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start	NB				SB				Combined		4/8/2018	
Time	A.M.		P.M.		A.M.	P.M.			A.M.	P.M.	Sun	
12:00	2		22		0	19			2	41		
12:15	3		17		0	19			3	36		
12:30	0		14		0	21			0	35		
12:45	1	6	17	70	1	29	88		2	46	158	
01:00	1		19		1	21			2	40		
01:15	0		17		1	27			1	44		
01:30	1		15		0	20			1	35		
01:45	0	2	17	68	0	22	90		0	39	158	
02:00	0		13		0	11			0	24		
02:15	1		22		0	16			1	38		
02:30	0		18		1	8			1	26		
02:45	1	2	17	70	0	21	56		1	38	126	
03:00	0		12		0	7			0	19		
03:15	0		9		0	16			0	25		
03:30	0		15		0	16			0	31		
03:45	0	0	17	53	1	17	56		1	34	109	
04:00	0		15		1	12			1	27		
04:15	0		11		0	17			0	28		
04:30	0		17		0	12			0	29		
04:45	1	1	17	60	0	9	50		1	26	110	
05:00	0		14		1	14			1	28		
05:15	0		12		4	12			4	24		
05:30	2		8		0	14			2	22		
05:45	1	3	16	50	1	13	53		2	29	103	
06:00	0		6		1	14			1	20		
06:15	0		7		2	8			2	15		
06:30	2		8		1	8			3	16		
06:45	3	5	9	30	1	12	42		4	21	72	
07:00	3		11		1	7			4	18		
07:15	6		13		1	6			7	19		
07:30	2		4		2	5			4	9		
07:45	0	11	5	33	2	1	19		2	6	52	
08:00	4		8		5	6			9	14		
08:15	3		2		8	4			11	6		
08:30	6		7		12	5			18	12		
08:45	7	20	2	19	5	30	4	19	12	6	38	
09:00	9		1		8	3			17	4		
09:15	9		8		9	1			18	9		
09:30	3		0		9	2			12	2		
09:45	7	28	4	13	11	37	3	9	18	7	22	
10:00	11		2		7	1			18	3		
10:15	12		2		19	1			31	3		
10:30	15		1		10	4			25	5		
10:45	16	54	2	7	20	56	0	6	36	2	13	
11:00	16		1		8	1			24	2		
11:15	12		1		14	2			26	3		
11:30	16		2		12	2			28	4		
11:45	19	63	1	5	13	47	1	6	32	2	11	
Total	195		478		193	494			388	972		
Percent	50.3%		49.2%		49.7%	50.8%						
Day Total		673			687				1360			
Peak	11:00	-	12:00	-	10:15	-	00:30	-	10:15	-	00:30	-
Vol.	63	-	70	-	57	-	98	-	116	-	165	-
P.H.F.	0.829		0.795		0.713		0.845		0.806		0.897	



PRECISION
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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/9/2018		
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Mon
12:00	1		16		0		14		1		30		
12:15	1		22		1		12		2		34		
12:30	1		23		1		24		2		47		
12:45	1	4	20	81	0	2	18	68	1	6	38	149	
01:00	0		19		0		17		0		36		
01:15	0		12		0		11		0		23		
01:30	0		17		0		16		0		33		
01:45	0	0	15	63	0	0	17	61	0	0	32	124	
02:00	1		19		1		20		2		39		
02:15	0		18		0		21		0		39		
02:30	1		17		0		27		1		44		
02:45	0	2	23	77	0	1	32	100	0	3	55	177	
03:00	0		28		1		46		1		74		
03:15	0		21		0		40		0		61		
03:30	0		20		0		44		0		64		
03:45	0	0	24	93	0	1	42	172	0	1	66	265	
04:00	0		30		0		82		0		112		
04:15	1		39		1		82		2		121		
04:30	0		19		1		67		1		86		
04:45	1	2	43	131	3	5	58	289	4	7	101	420	
05:00	4		31		1		58		5		89		
05:15	1		25		9		79		10		104		
05:30	4		23		11		61		15		84		
05:45	14	23	44	123	9	30	51	249	23	53	95	372	
06:00	9		30		14		34		23		64		
06:15	8		24		29		35		37		59		
06:30	12		14		54		22		66		36		
06:45	29	58	20	88	77	174	32	123	106	232	52	211	
07:00	36		19		96		13		132		32		
07:15	48		15		95		13		143		28		
07:30	50		6		61		8		111		14		
07:45	60	194	11	51	61	313	3	37	121	507	14	88	
08:00	43		9		92		15		135		24		
08:15	46		4		124		4		170		8		
08:30	58		5		58		9		116		14		
08:45	52	199	4	22	68	342	7	35	120	541	11	57	
09:00	39		5		53		7		92		12		
09:15	19		4		42		5		61		9		
09:30	21		3		42		6		63		9		
09:45	23	102	3	15	26	163	4	22	49	265	7	37	
10:00	13		3		21		3		34		6		
10:15	13		2		17		3		30		5		
10:30	21		3		9		0		30		3		
10:45	11	58	3	11	11	58	1	7	22	116	4	18	
11:00	14		1		17		1		31		2		
11:15	13		2		13		4		26		6		
11:30	12		1		18		1		30		2		
11:45	17	56	1	5	13	61	2	8	30	117	3	13	
Total	698		760		1150		1171		1848		1931		
Percent	37.8%		39.4%		62.2%		60.6%						
Day Total			1458				2321				3779		
Peak	07:45	-	04:15	-	08:00	-	04:00	-	07:45	-	04:00	-	-
Vol.	207	-	132	-	342	-	289	-	542	-	420	-	-
P.H.F.	0.863		0.767		0.690		0.881		0.797		0.868		



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start	NB				SB				Combin		4/10/201	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	8	Tue
12:00	5		18		2		24		7	42		
12:15	0		27		0		23		0	50		
12:30	0		18		0		14		0	32		
12:45	2	7	16	79	0	2	9	70	2	25	9	149
01:00	1		16		1		17		2	33		
01:15	0		13		1		17		1	30		
01:30	1		13		1		11		2	24		
01:45	0	2	21	63	0	3	13	58	0	34	5	121
02:00	0		18		0		22		0	40		
02:15	0		16		0		23		0	39		
02:30	0		16		2		27		2	43		
02:45	2	2	25	75	0	2	41	113	2	66	4	188
03:00	1		36		0		54		1	90		
03:15	0		28		0		50		0	78		
03:30	0		37		0		85		0	122		
03:45	0	1	29	130	0	0	67	256	0	96	1	386
04:00	0		31		1		111		1	142		
04:15	0		40		1		96		1	136		
04:30	3		37		1		105		4	142		
04:45	0	3	29	137	2	5	81	393	2	110	8	530
05:00	1		30		1		85		2	115		
05:15	5		35		4		67		9	102		
05:30	2		22		14		64		16	86		
05:45	10	18	31	118	12	31	42	258	22	73	49	376
06:00	10		32		17		47		27	79		
06:15	11		29		26		31		37	60		
06:30	22		23		63		26		85	49		
06:45	35	78	9	93	90	196	19	123	125	28	274	216
07:00	31		13		86		17		117	30		
07:15	44		15		95		13		139	28		
07:30	58		6		84		16		142	22		
07:45	47	180	12	46	60	325	6	52	107	18	505	98
08:00	36		2		92		6		128	8		
08:15	58		6		65		10		123	16		
08:30	46		3		68		4		114	7		
08:45	59	199	8	19	61	286	8	28	120	16	485	47
09:00	39		9		65		2		104	11		
09:15	33		1		47		3		80	4		
09:30	28		3		44		3		72	6		
09:45	22	122	2	15	33	189	0	8	55	2	311	23
10:00	16		6		15		1		31	7		
10:15	11		6		14		1		25	7		
10:30	19		0		22		2		41	2		
10:45	16	62	3	15	29	80	1	5	45	4	142	20
11:00	18		3		14		2		32	5		
11:15	18		1		15		1		33	2		
11:30	18		2		19		0		37	2		
11:45	13	67	1	7	20	68	1	4	33	2	135	11
Total	741		797		1187		1368		1928		2165	
Percent	38.4%		36.8%		61.6%		63.2%					
Day Total		1538				2555				4093		
Peak	08:15	-	03:30	-	06:45	-	04:00	-	06:45	-	04:00	-
Vol.	202	-	137	-	355	-	393	-	523	-	530	-
P.H.F.	0.856		0.856		0.934		0.885		0.921		0.933	



PRECISION
D A T A
INDUSTRIES, LLC

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165-183 Bedford Road
south of Route 2A
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 B Volume
Site Code: TBA

Start	NB				SB				Combined		4/11/2018 Wed	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.		
12:00	2		39		2		41		4	80		
12:15	0		32		0		30		0	62		
12:30	1		23		1		20		2	43		
12:45	0	3	46	140	0	3	39	130	0	85	270	
01:00	0		24		1		26		1	50		
01:15	0		23		2		26		2	49		
01:30	0		23		1		20		1	43		
01:45	1	1	34	104	0	4	32	104	1	66	208	
02:00	0		33		0		44		0	77		
02:15	0		27		0		35		0	62		
02:30	0		31		0		32		0	63		
02:45	0	0	30	121	0	0	44	155	0	74	276	
03:00	0		44		1		53		1	97		
03:15	1		27		0		65		1	92		
03:30	0		32		0		79		0	111		
03:45	0	1	32	135	0	1	72	269	0	104	404	
04:00	0		34		2		76		2	110		
04:15	0		31		1		67		1	98		
04:30	1		25		1		74		2	99		
04:45	2	3	28	118	2	6	89	306	4	117	424	
05:00	5		36		0		70		5	106		
05:15	3		31		5		92		8	123		
05:30	2		21		8		67		10	88		
05:45	8	18	25	113	11	24	61	290	19	86	403	
06:00	12		19		17		45		29	64		
06:15	7		32		31		41		38	73		
06:30	21		27		52		25		73	52		
06:45	31	71	18	96	84	184	21	132	115	39	228	
07:00	35		12		102		14		137	26		
07:15	41		15		84		19		125	34		
07:30	56		17		64		14		120	31		
07:45	55	187	11	55	71	321	10	57	126	21	112	
08:00	41		7		79		6		120	13		
08:15	51		9		60		12		111	21		
08:30	43		6		86		2		129	8		
08:45	39	174	4	26	66	291	11	31	105	15	57	
09:00	60		4		62		7		122	11		
09:15	43		5		50		8		93	13		
09:30	38		7		42		2		80	9		
09:45	30	171	8	24	44	198	3	20	74	11	44	
10:00	33		4		33		2		66	6		
10:15	23		4		18		2		41	6		
10:30	25		2		28		1		53	3		
10:45	22	103	1	11	24	103	1	6	46	2	17	
11:00	19		1		15		2		34	3		
11:15	30		2		29		0		59	2		
11:30	26		1		33		3		59	4		
11:45	21	96	0	4	21	98	2	7	42	2	11	
Total	828		947		1233		1507		2061	2454		
Percent	40.2%		38.6%		59.8%		61.4%					
Day Total		1775			2740				4515			
Peak	07:30	-	12:00	-	06:45	-	04:30	-	07:00	-	-	-
Vol.	203	-	140	-	334	-	325	-	508	-	445	-
P.H.F.	0.906		0.761		0.819		0.883		0.927		0.904	



PRECISION
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INDUSTRIES, LLC

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11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Class

Site Code: TBA

NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	4	1	0	0	0	0	0	0	0	0	0	0	5
01:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
02:00	0	4	1	0	1	0	0	0	0	0	0	0	0	6
03:00	0	3	2	1	1	0	0	0	0	0	0	0	0	7
04:00	0	15	3	0	3	0	0	0	0	0	0	0	0	21
05:00	0	133	26	1	27	0	0	0	0	0	0	0	0	187
06:00	4	234	86	2	35	3	1	1	0	0	0	0	0	366
07:00	1	544	157	10	34	2	0	5	1	0	0	0	0	754
08:00	3	545	182	3	40	2	1	0	0	0	0	0	0	776
09:00	0	378	113	5	24	2	0	1	0	0	0	0	0	523
10:00	0	179	43	0	16	1	0	2	0	0	0	0	0	241
11:00	0	153	49	3	16	0	0	0	0	0	0	0	0	221
12 PM	1	132	48	1	16	1	0	0	1	0	0	0	0	200
13:00	1	124	34	1	9	0	2	0	1	1	0	0	0	173
14:00	0	136	55	3	13	1	0	1	0	0	0	0	0	209
15:00	0	205	68	6	17	2	0	0	0	0	0	0	0	298
16:00	0	221	60	3	12	0	0	0	0	0	0	0	0	296
17:00	0	260	69	1	13	1	0	0	0	0	0	0	0	344
18:00	0	190	37	0	5	1	0	0	0	0	0	0	0	233
19:00	0	100	26	2	3	0	0	0	0	0	0	0	0	131
20:00	0	56	24	0	0	0	0	0	0	0	0	0	0	80
21:00	0	45	12	0	2	0	0	0	0	0	0	0	0	59
22:00	0	19	7	0	1	0	0	0	0	0	0	0	0	27
23:00	0	28	3	0	1	0	0	0	0	0	0	0	0	32
Total	10	3711	1106	42	289	16	4	10	3	1	0	0	0	5192
Percent	0.2%	71.5%	21.3%	0.8%	5.6%	0.3%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	08:00	08:00	07:00	08:00	06:00	06:00	07:00	07:00					08:00
Vol.	4	545	182	10	40	3	1	5	1					776
PM Peak	12:00	17:00	17:00	15:00	15:00	15:00	13:00	14:00	12:00	13:00				17:00
Vol.	1	260	69	6	17	2	2	1	1	1				344



PRECISION
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11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Class

Site Code: TBA

NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	4	0	0	0	0	0	0	0	0	0	0	0	4
01:00	0	5	0	0	0	0	0	0	0	1	0	0	0	6
02:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
03:00	0	4	1	2	1	0	0	0	0	0	0	0	0	8
04:00	1	12	2	0	3	1	0	1	0	0	0	0	0	20
05:00	0	118	32	0	14	0	0	0	0	0	0	0	0	164
06:00	0	223	50	5	35	0	0	0	0	0	0	0	0	313
07:00	0	420	109	8	36	3	0	1	0	0	0	0	0	577
08:00	1	436	124	1	23	2	1	2	0	0	0	0	0	590
09:00	2	290	63	0	14	2	0	2	2	0	0	0	0	375
10:00	0	172	44	1	8	0	0	0	2	0	0	0	0	227
11:00	1	142	25	1	7	0	1	2	1	0	0	0	0	180
12 PM	0	114	36	1	4	0	0	1	0	0	0	0	0	156
13:00	2	127	35	2	14	2	0	1	0	0	0	0	0	183
14:00	0	148	35	0	8	0	0	0	0	0	0	0	0	191
15:00	0	235	52	2	14	0	0	0	1	0	0	0	0	304
16:00	1	197	35	5	5	2	0	0	0	0	0	0	0	245
17:00	0	229	27	1	5	0	0	1	0	0	0	0	0	263
18:00	2	172	27	0	2	0	0	0	0	0	0	0	0	203
19:00	0	84	15	0	3	0	0	0	0	1	0	0	0	103
20:00	0	65	7	0	1	0	0	0	0	0	0	0	0	73
21:00	0	43	13	0	0	0	0	0	0	0	0	0	0	56
22:00	0	31	8	0	1	0	0	0	0	0	0	0	0	40
23:00	0	32	2	0	1	0	0	0	0	0	0	0	0	35
Total	10	3306	744	29	199	12	2	11	6	2	0	0	0	4321
Percent	0.2%	76.5%	17.2%	0.7%	4.6%	0.3%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	08:00	08:00	07:00	07:00	07:00	08:00	08:00	09:00	01:00				08:00
Vol.	2	436	124	8	36	3	1	2	2	1				590
PM Peak	13:00	15:00	15:00	16:00	13:00	13:00		12:00	15:00	19:00				15:00
Vol.	2	235	52	5	14	2		1	1	1				304



PRECISION
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11 Cambridge Turnpike Cutoff
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176038 C Class

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NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/07/1														
8	0	8	3	0	0	0	0	0	0	0	0	0	0	11
01:00	0	5	1	0	0	0	0	0	0	0	0	0	0	6
02:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
03:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
04:00	0	3	3	0	0	0	0	0	0	0	0	0	0	6
05:00	0	13	8	0	1	0	0	0	0	0	0	0	0	22
06:00	0	35	10	0	0	0	0	0	0	0	0	0	0	45
07:00	0	82	10	1	8	0	0	0	0	0	0	0	0	101
08:00	0	127	6	2	3	0	0	0	0	0	0	0	0	138
09:00	0	135	25	1	3	0	0	0	0	0	0	0	0	164
10:00	2	149	25	1	3	0	0	0	0	0	0	0	0	180
11:00	0	171	29	0	8	0	0	0	0	0	0	0	0	208
12 PM	0	181	35	0	3	0	0	0	0	0	0	0	0	219
13:00	0	153	28	0	4	0	0	0	0	0	0	0	0	185
14:00	1	166	21	0	4	0	0	0	0	0	0	0	0	192
15:00	0	138	26	0	5	0	0	0	0	0	0	0	0	169
16:00	0	145	21	0	3	0	0	0	0	0	0	0	0	169
17:00	1	119	27	0	2	1	0	0	0	0	0	0	0	150
18:00	0	113	14	0	2	0	0	0	0	0	0	0	0	129
19:00	0	70	12	0	0	0	0	0	0	0	0	0	0	82
20:00	0	49	11	1	1	0	0	0	0	0	0	0	0	62
21:00	0	42	3	0	0	0	0	0	0	0	0	0	0	45
22:00	0	33	10	0	0	0	0	0	0	0	0	0	0	43
23:00	0	32	5	0	0	0	0	0	0	0	0	0	0	37
Total	4	1975	335	6	50	1	0	0	0	0	0	0	0	2371
Percent	0.2%	83.3%	14.1%	0.3%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	11:00	08:00	07:00									11:00
Vol.	2	171	29	2	8									208
PM Peak	14:00	12:00	12:00	20:00	15:00	17:00								12:00
Vol.	1	181	35	1	5	1								219



PRECISION
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176038 C Class

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NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/08/1														
8	0	15	0	0	0	0	0	0	0	0	0	0	0	15
01:00	0	6	1	0	0	0	0	0	0	0	0	0	0	7
02:00	0	9	1	0	0	0	0	0	0	0	0	0	0	10
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
05:00	0	5	1	0	1	0	0	0	0	0	0	0	0	7
06:00	0	21	2	0	1	0	0	0	0	0	0	0	0	24
07:00	0	48	10	0	5	0	0	0	0	0	0	0	0	63
08:00	0	107	12	0	1	0	0	0	0	0	0	0	0	120
09:00	0	120	20	0	0	0	0	0	0	0	0	0	0	140
10:00	0	165	14	0	1	1	0	0	0	0	0	0	0	181
11:00	0	122	22	0	7	0	0	0	0	0	0	0	0	151
12 PM	1	158	35	0	6	1	0	1	0	0	0	0	0	202
13:00	0	178	27	0	4	0	0	1	0	0	0	0	0	210
14:00	0	146	14	0	4	0	0	0	0	0	0	0	0	164
15:00	1	128	17	0	0	0	0	1	0	0	0	0	0	147
16:00	1	119	17	0	2	1	0	0	0	0	0	0	0	140
17:00	0	110	18	0	5	0	0	0	0	0	0	0	0	133
18:00	0	100	21	0	3	0	0	0	0	1	0	0	0	125
19:00	0	82	7	0	2	0	0	0	0	0	0	0	0	91
20:00	0	55	13	0	0	0	0	0	0	0	0	0	0	68
21:00	0	34	2	0	1	0	0	0	0	0	0	0	0	37
22:00	0	16	10	0	0	0	0	0	0	0	0	0	0	26
23:00	0	14	3	0	0	0	0	0	0	0	0	0	0	17
Total	3	1761	269	0	43	3	0	3	0	1	0	0	0	2083
Percent	0.1%	84.5%	12.9%	0.0%	2.1%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM														
Peak		10:00	11:00		11:00	10:00								10:00
Vol.		165	22		7	1								181
PM														
Peak	12:00	13:00	12:00		12:00	12:00		12:00		18:00				13:00
Vol.	1	178	35		6	1		1		1				210



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Class

Site Code: TBA

NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	9	0	1	0	0	0	0	0	0	0	0	0	10
01:00	0	3	0	0	1	0	0	0	0	0	0	0	0	4
02:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	16	2	0	2	0	0	0	0	0	0	0	0	20
05:00	0	144	28	0	12	1	0	0	1	0	0	0	0	186
06:00	1	278	60	3	20	1	2	2	0	0	0	0	0	367
07:00	0	628	82	8	16	3	1	2	1	0	0	0	0	741
08:00	1	663	99	4	23	3	0	1	3	0	0	0	0	797
09:00	2	325	44	2	13	1	1	0	0	0	0	0	0	388
10:00	0	135	47	2	12	0	0	0	3	0	0	0	0	199
11:00	0	138	25	2	7	0	1	1	1	0	0	0	0	175
12 PM	1	138	32	1	8	2	0	0	1	0	0	0	0	183
13:00	0	119	27	2	4	1	1	2	1	0	0	0	0	157
14:00	0	123	27	3	11	0	0	0	1	0	0	0	0	165
15:00	0	206	32	5	8	2	0	0	0	0	0	0	0	253
16:00	1	211	47	4	8	2	0	0	0	0	0	0	0	273
17:00	1	256	42	3	8	2	0	0	0	0	0	0	0	312
18:00	2	155	20	0	4	1	0	0	0	0	0	0	0	182
19:00	2	98	16	1	0	0	0	0	0	0	0	0	0	117
20:00	0	60	3	1	1	0	0	0	0	0	0	0	0	65
21:00	0	45	7	0	1	0	0	0	0	0	0	0	0	53
22:00	0	14	6	0	1	0	0	0	0	0	0	0	0	21
23:00	0	22	3	0	0	0	0	0	0	0	0	0	0	25
Total	11	3790	650	42	160	19	6	8	12	0	0	0	0	4698
Percent	0.2%	80.7%	13.8%	0.9%	3.4%	0.4%	0.1%	0.2%	0.3%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	08:00	08:00	07:00	08:00	07:00	06:00	06:00	08:00					08:00
Vol.	2	663	99	8	23	3	2	2	3					797
PM Peak	18:00	17:00	16:00	15:00	14:00	12:00	13:00	13:00	12:00					17:00
Vol.	2	256	47	5	11	2	1	2	1					312



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City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Class

Site Code: TBA

NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	5	1	0	0	0	0	0	0	0	0	0	0	6
01:00	0	4	0	0	0	0	0	0	1	0	0	0	0	5
02:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
03:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
04:00	0	18	5	0	2	0	0	1	1	0	0	0	0	27
05:00	0	157	31	0	14	1	0	0	0	0	0	0	0	203
06:00	1	327	72	1	22	3	2	0	3	0	0	0	0	431
07:00	1	698	93	7	19	5	2	0	1	0	0	0	0	826
08:00	0	573	75	3	15	3	0	1	2	0	0	0	0	672
09:00	0	380	54	0	12	3	1	1	0	0	0	0	0	451
10:00	0	185	30	4	7	1	0	0	1	0	0	0	0	228
11:00	0	137	26	4	6	1	1	0	0	0	0	0	0	175
12 PM	0	161	25	2	10	1	0	0	2	0	0	0	0	201
13:00	0	124	35	1	6	0	0	0	0	0	0	0	0	166
14:00	0	131	30	0	6	1	0	1	1	0	0	0	0	170
15:00	0	210	36	7	17	3	0	1	0	0	0	0	0	274
16:00	0	246	57	4	7	0	0	1	0	0	0	0	0	315
17:00	0	259	42	2	5	0	0	1	0	0	0	0	0	309
18:00	0	179	31	2	4	1	0	0	0	0	0	0	0	217
19:00	0	81	12	1	3	0	0	0	0	0	0	0	0	97
20:00	1	52	16	1	1	0	0	0	0	0	0	0	0	71
21:00	0	46	7	0	0	0	0	0	0	0	0	0	0	53
22:00	0	26	4	0	2	0	0	0	0	0	0	0	0	32
23:00	0	16	1	0	1	0	0	0	0	0	0	0	0	18
Total	3	4019	687	39	159	23	6	7	12	0	0	0	0	4955
Percent	0.1%	81.1%	13.9%	0.8%	3.2%	0.5%	0.1%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	07:00	07:00	07:00	06:00	07:00	06:00	04:00	06:00					07:00
Vol.	1	698	93	7	22	5	2	1	3					826
PM Peak	20:00	17:00	16:00	15:00	15:00	15:00		14:00	12:00					16:00
Vol.	1	259	57	7	17	3		1	2					315



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NB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	5	0	0	0	0	0	0	0	0	0	0	0	5
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	8	1	0	1	0	0	0	0	0	0	0	0	10
03:00	1	5	0	1	0	0	0	0	0	0	0	0	0	7
04:00	0	21	4	0	1	0	0	0	0	0	0	0	0	26
05:00	0	135	35	0	15	0	0	0	0	0	0	0	0	185
06:00	1	287	59	4	22	3	1	1	0	0	0	0	0	378
07:00	5	704	89	6	27	2	0	3	1	0	0	0	0	837
08:00	2	609	79	2	10	2	0	1	0	0	0	0	0	705
09:00	0	346	46	0	9	1	1	0	0	0	0	0	0	403
10:00	0	178	37	4	14	2	0	1	1	0	0	0	0	237
11:00	0	152	26	1	4	0	0	0	1	0	0	0	0	184
12 PM	1	165	32	3	10	1	0	1	0	0	0	0	0	213
13:00	0	131	40	6	13	3	0	2	0	0	0	0	0	195
14:00	1	138	24	5	7	1	0	0	0	0	0	0	0	176
15:00	0	213	60	6	10	0	0	0	0	0	0	0	0	289
16:00	4	211	34	1	6	1	1	1	0	0	0	0	0	259
17:00	1	288	52	0	3	1	0	1	0	0	0	0	0	346
18:00	1	191	30	0	8	0	0	0	0	0	0	0	0	230
19:00	1	107	16	1	4	0	0	1	0	0	0	0	0	130
20:00	0	78	10	0	3	0	0	0	0	0	0	0	0	91
21:00	1	49	4	0	1	0	0	0	0	0	0	0	0	55
22:00	0	34	9	0	0	0	0	0	0	0	0	0	0	43
23:00	0	15	1	0	0	0	0	0	0	0	0	0	0	16
Total	19	4071	688	40	168	17	3	12	3	0	0	0	0	5021
Percent	0.4%	81.1%	13.7%	0.8%	3.3%	0.3%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	07:00	07:00	07:00	06:00	06:00	07:00	07:00					07:00
Vol.	5	704	89	6	27	3	1	3	1					837
PM Peak	16:00	17:00	15:00	13:00	13:00	13:00	16:00	13:00						17:00
Vol.	4	288	60	6	13	3	1	2						346



PRECISION
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SB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	5	3	0	0	0	0	0	0	0	0	0	0	8
01:00	0	11	1	0	1	0	0	0	0	0	0	0	0	13
02:00	0	4	1	0	1	0	0	0	0	0	0	0	0	6
03:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
04:00	0	4	4	0	1	0	0	0	0	0	0	0	0	9
05:00	0	23	10	6	1	0	0	0	0	0	0	0	0	40
06:00	0	107	36	0	5	1	0	1	1	0	0	0	0	151
07:00	0	212	46	3	11	4	0	2	0	0	0	0	0	278
08:00	0	297	56	4	4	2	0	0	0	0	0	0	0	363
09:00	1	192	40	0	3	2	0	0	3	0	0	0	0	241
10:00	0	151	30	1	5	3	0	1	2	0	0	0	0	193
11:00	3	154	39	0	13	2	0	1	4	2	0	0	0	218
12 PM	0	214	28	2	6	2	1	1	1	0	0	0	0	255
13:00	1	176	44	0	11	0	0	0	0	1	0	0	0	233
14:00	0	268	62	7	8	1	0	0	0	0	0	0	0	346
15:00	3	384	91	4	13	4	0	2	0	0	0	0	0	501
16:00	0	447	75	0	10	2	0	0	0	0	0	0	0	534
17:00	1	494	44	0	5	2	0	0	1	0	0	0	0	547
18:00	0	312	32	2	1	1	0	0	1	0	0	0	0	349
19:00	0	189	19	0	2	0	0	0	0	0	0	0	0	210
20:00	0	127	10	0	1	0	0	0	0	0	0	0	0	138
21:00	0	106	13	0	0	0	0	0	0	0	0	0	0	119
22:00	1	38	7	0	0	1	0	0	0	0	0	0	0	47
23:00	0	25	4	0	1	0	0	0	0	0	0	0	0	30
Total	10	3945	695	29	103	27	1	8	13	3	0	0	0	4834
Percent	0.2%	81.6%	14.4%	0.6%	2.1%	0.6%	0.0%	0.2%	0.3%	0.1%	0.0%	0.0%	0.0%	
AM Peak	11:00	08:00	08:00	05:00	11:00	07:00		07:00	11:00	11:00				08:00
Vol.	3	297	56	6	13	4		2	4	2				363
PM Peak	15:00	17:00	15:00	14:00	15:00	15:00	12:00	15:00	12:00	13:00				17:00
Vol.	3	494	91	7	13	4	1	2	1	1				547



PRECISION
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SB

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04/06/1														
8	0	14	0	1	1	0	0	0	0	0	0	0	0	16
01:00	0	8	1	0	1	0	0	0	1	0	0	0	0	11
02:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
03:00	0	3	0	0	0	1	0	0	0	0	0	0	0	4
04:00	0	2	4	0	1	0	0	0	0	0	0	0	0	7
05:00	0	28	10	6	1	0	0	0	0	0	0	0	0	45
06:00	1	102	30	4	5	0	0	1	0	0	0	0	0	143
07:00	0	217	50	1	3	1	0	0	0	0	0	0	0	272
08:00	0	270	38	0	9	0	0	0	0	0	0	0	0	317
09:00	1	167	41	2	7	2	0	1	0	0	0	0	0	221
10:00	1	128	29	0	10	1	0	0	4	1	0	0	0	174
11:00	0	159	23	0	7	0	0	3	0	1	0	0	0	193
12 PM	0	171	32	1	7	4	1	0	1	0	0	0	0	217
13:00	1	176	45	3	7	3	1	1	1	1	0	0	0	239
14:00	1	325	59	6	9	0	0	0	0	0	0	0	0	400
15:00	0	372	62	0	6	0	0	0	2	0	0	0	0	442
16:00	1	506	43	1	9	0	0	0	0	0	0	0	0	560
17:00	1	574	40	0	4	0	0	1	0	0	0	0	0	620
18:00	0	314	17	0	4	0	0	0	0	0	0	0	0	335
19:00	0	140	13	0	3	0	0	0	0	0	0	0	0	156
20:00	0	87	3	0	0	0	0	0	0	0	0	0	0	90
21:00	1	74	7	0	2	0	0	0	0	0	0	0	0	84
22:00	0	79	12	0	0	0	0	0	0	0	0	0	0	91
23:00	0	46	2	0	1	0	0	0	0	0	0	0	0	49
Total	8	3969	561	25	97	12	2	7	9	3	0	0	0	4693
Percent	0.2%	84.6%	12.0%	0.5%	2.1%	0.3%	0.0%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	
AM Peak	06:00	08:00	07:00	05:00	10:00	09:00		11:00	10:00	10:00				08:00
Vol.	1	270	50	6	10	2		3	4	1				317
PM Peak	13:00	17:00	15:00	14:00	14:00	12:00	12:00	13:00	15:00	13:00				17:00
Vol.	1	574	62	6	9	4	1	1	2	1				620



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04/07/1														
8	0	20	2	0	1	0	0	0	0	0	0	0	0	23
01:00	0	10	0	0	0	0	0	0	0	0	0	0	0	10
02:00	0	10	1	0	2	1	0	0	0	0	0	0	0	14
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
05:00	0	7	3	0	0	0	0	0	0	0	0	0	0	10
06:00	0	60	13	0	1	0	0	0	0	0	0	0	0	74
07:00	0	44	18	0	3	0	0	1	0	0	0	0	0	66
08:00	0	92	12	2	5	1	0	0	1	0	0	0	0	113
09:00	0	102	12	0	3	0	0	0	0	0	0	0	0	117
10:00	0	162	12	0	2	2	0	0	0	0	0	0	0	178
11:00	0	182	18	0	5	0	0	1	0	0	0	0	0	206
12 PM	0	192	23	0	1	0	0	0	1	0	0	0	0	217
13:00	1	212	13	1	4	0	0	0	1	0	0	0	0	232
14:00	1	220	24	1	3	0	0	0	0	0	0	0	0	249
15:00	0	222	22	0	3	0	0	0	0	0	0	0	0	247
16:00	1	213	15	0	2	0	0	0	0	0	0	0	0	231
17:00	1	137	19	0	1	0	0	0	0	0	0	0	0	158
18:00	0	150	10	0	3	0	0	0	0	0	0	0	0	163
19:00	0	128	8	0	0	0	0	0	0	0	0	0	0	136
20:00	0	78	12	1	2	0	0	0	0	0	0	0	0	93
21:00	1	67	6	0	0	0	0	0	0	0	0	0	0	74
22:00	0	92	1	0	0	0	0	0	0	0	0	0	0	93
23:00	0	36	1	0	0	0	0	0	0	0	0	0	0	37
Total	5	2441	247	5	41	4	0	2	3	0	0	0	0	2748
Percent	0.2%	88.8%	9.0%	0.2%	1.5%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak		11:00	07:00	08:00	08:00	10:00		07:00	08:00					11:00
Vol.		182	18	2	5	2		1	1					206
PM Peak	13:00	15:00	14:00	13:00	13:00				12:00					14:00
Vol.	1	222	24	1	4				1					249



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south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Class

Site Code: TBA

SB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/08/1														
8	0	24	1	0	0	0	0	0	0	0	0	0	0	25
01:00	0	20	0	0	0	0	0	0	0	0	0	0	0	20
02:00	0	9	1	0	0	0	0	0	0	0	0	0	0	10
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	5	1	0	0	0	0	0	0	0	0	0	0	6
05:00	0	8	3	0	0	0	0	0	0	0	0	0	0	11
06:00	0	42	7	0	0	0	0	0	0	0	0	0	0	49
07:00	0	45	7	0	0	0	0	0	0	0	0	0	0	52
08:00	0	69	6	1	1	0	0	0	0	0	0	0	0	77
09:00	0	90	4	0	2	0	0	0	0	0	0	0	0	96
10:00	1	137	18	0	2	0	0	0	0	1	0	0	0	159
11:00	0	142	18	0	1	0	0	0	0	0	0	0	0	161
12 PM	3	225	19	0	0	0	0	0	0	0	0	0	0	247
13:00	0	215	23	0	1	0	0	0	0	0	0	0	0	239
14:00	0	181	15	0	1	0	0	0	0	0	0	0	0	197
15:00	0	188	19	0	1	0	0	1	0	0	0	0	0	209
16:00	1	139	16	0	0	0	0	0	0	0	0	0	0	156
17:00	0	136	9	0	1	0	0	0	0	0	0	0	0	146
18:00	0	125	7	0	1	0	0	0	0	0	0	0	0	133
19:00	0	98	7	0	1	0	0	0	0	0	0	0	0	106
20:00	0	78	8	0	1	0	0	0	0	0	0	0	0	87
21:00	1	46	1	0	0	0	0	0	0	0	0	0	0	48
22:00	0	39	4	0	1	0	0	0	0	0	0	0	0	44
23:00	0	13	2	0	0	0	0	0	0	0	0	0	0	15
Total	6	2077	196	1	14	0	0	1	0	1	0	0	0	2296
Percent	0.3%	90.5%	8.5%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	10:00	08:00	09:00					10:00				11:00
Vol.	1	142	18	1	2					1				161
PM Peak	12:00	12:00	13:00		13:00			15:00						12:00
Vol.	3	225	23		1			1						247



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Class

Site Code: TBA

SB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	10	3	0	0	0	0	0	0	0	0	0	0	13
01:00	0	4	1	0	1	0	0	0	0	0	0	0	0	6
02:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
03:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
04:00	0	4	1	0	0	1	0	0	0	0	0	0	0	6
05:00	1	31	5	5	0	1	0	0	0	0	0	0	0	43
06:00	0	119	29	0	1	0	0	0	0	0	0	0	0	149
07:00	2	238	44	0	3	3	0	2	0	0	0	0	0	292
08:00	3	283	47	0	7	6	0	0	0	0	0	0	0	346
09:00	0	229	44	1	11	3	0	1	2	0	0	0	0	291
10:00	2	143	26	1	2	1	0	0	4	0	0	0	0	179
11:00	1	136	31	1	13	2	0	2	2	0	0	0	0	188
12 PM	2	167	22	0	8	4	0	1	4	0	0	0	0	208
13:00	0	178	36	0	13	4	1	1	2	0	0	0	0	235
14:00	0	247	54	8	4	2	0	2	2	0	0	0	0	319
15:00	1	335	65	2	7	2	0	2	0	0	0	0	0	414
16:00	1	424	54	0	10	0	0	1	1	0	0	0	0	491
17:00	0	442	36	1	2	0	0	0	0	0	0	0	0	481
18:00	0	316	32	0	2	0	0	0	0	0	0	0	0	350
19:00	0	169	14	2	4	0	0	0	0	0	0	0	0	189
20:00	0	106	11	0	1	0	0	0	0	0	0	0	0	118
21:00	1	71	9	0	0	0	0	0	0	0	0	0	0	81
22:00	0	44	2	0	0	0	0	0	0	0	0	0	0	46
23:00	0	29	2	0	1	0	0	0	0	0	0	0	0	32
Total	14	3730	570	21	90	29	1	12	17	0	0	0	0	4484
Percent	0.3%	83.2%	12.7%	0.5%	2.0%	0.6%	0.0%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	05:00	11:00	08:00		07:00	10:00					08:00
Vol.	3	283	47	5	13	6		2	4					346
PM Peak	12:00	17:00	15:00	14:00	13:00	12:00	13:00	14:00	12:00					16:00
Vol.	2	442	65	8	13	4	1	2	4					491



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176038 C Class

Site Code: TBA

SB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	7	2	0	0	0	0	0	0	0	0	0	0	9
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	1	3	0	0	1	1	0	0	0	0	0	0	0	6
03:00	0	1	1	0	1	0	0	0	0	0	0	0	0	3
04:00	0	4	4	0	0	1	1	0	0	0	0	0	0	10
05:00	1	30	6	6	1	0	0	1	0	0	0	0	0	45
06:00	0	121	27	0	2	1	1	0	1	0	0	0	0	153
07:00	3	227	44	0	11	2	0	0	1	0	0	0	0	288
08:00	2	270	45	2	8	7	0	3	1	1	0	0	0	339
09:00	0	216	49	4	5	2	0	0	3	0	0	0	0	279
10:00	0	155	23	1	10	1	1	1	1	1	0	0	0	194
11:00	0	139	30	5	3	1	0	0	1	0	0	0	0	179
12 PM	1	174	34	4	5	2	0	1	3	0	0	0	0	224
13:00	1	157	33	2	11	5	0	1	1	0	0	0	0	211
14:00	0	263	60	10	14	6	0	1	2	0	0	0	0	356
15:00	1	417	64	3	12	1	0	1	1	0	0	0	0	500
16:00	2	490	48	1	8	1	0	1	0	0	0	0	0	551
17:00	4	464	47	0	3	2	0	0	1	0	0	0	0	521
18:00	2	320	21	2	1	1	0	0	0	1	0	0	0	348
19:00	0	170	11	1	3	0	0	0	0	0	0	0	0	185
20:00	0	112	5	1	1	0	0	0	0	0	0	0	0	119
21:00	0	100	12	0	0	0	0	0	0	1	0	0	0	113
22:00	0	35	4	0	0	0	0	0	0	0	0	0	0	39
23:00	0	28	2	0	1	0	0	0	0	0	0	0	0	31
Total	18	3904	572	42	101	34	3	10	16	4	0	0	0	4704
Percent	0.4%	83.0%	12.2%	0.9%	2.1%	0.7%	0.1%	0.2%	0.3%	0.1%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	09:00	05:00	07:00	08:00	04:00	08:00	09:00	08:00				08:00
Vol.	3	270	49	6	11	7	1	3	3	1				339
PM Peak	17:00	16:00	15:00	14:00	14:00	14:00		12:00	12:00	18:00				16:00
Vol.	4	490	64	10	14	6		1	3	1				551



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04/11/1														
8	0	10	2	0	0	0	0	0	0	0	0	0	0	12
01:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
02:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
03:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
04:00	0	5	1	0	0	1	0	0	0	0	0	0	0	7
05:00	1	34	12	5	1	1	0	0	0	0	0	0	0	54
06:00	1	112	30	3	4	1	1	1	0	0	0	0	0	153
07:00	0	230	37	3	11	1	0	1	0	0	0	0	0	283
08:00	1	289	38	3	12	4	0	0	2	0	0	0	0	349
09:00	0	240	44	1	7	4	1	0	1	0	0	0	0	298
10:00	1	155	26	1	6	2	0	2	2	0	0	0	0	195
11:00	0	167	39	2	7	4	0	0	1	0	0	0	0	220
12 PM	0	210	25	2	5	1	0	1	2	0	0	0	0	246
13:00	0	176	51	6	12	2	1	1	1	0	0	0	0	250
14:00	0	280	67	2	7	1	0	2	1	0	0	0	0	360
15:00	1	365	77	2	10	1	0	1	0	0	0	0	0	457
16:00	1	496	50	1	9	1	0	0	0	0	0	0	0	558
17:00	1	510	61	0	7	0	0	0	1	0	0	0	0	580
18:00	1	340	32	1	4	0	0	0	0	0	0	0	0	378
19:00	1	219	20	0	6	0	0	0	0	0	0	0	0	246
20:00	0	132	10	0	1	0	0	0	0	0	0	0	0	143
21:00	0	99	11	0	0	0	0	0	0	0	0	0	0	110
22:00	0	55	4	0	0	0	0	0	1	1	0	0	0	61
23:00	0	30	3	0	1	0	0	0	0	0	0	0	0	34
Total	9	4167	640	32	110	24	3	9	12	1	0	0	0	5007
Percent	0.2%	83.2%	12.8%	0.6%	2.2%	0.5%	0.1%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	05:00	08:00	09:00	05:00	08:00	08:00	06:00	10:00	08:00					08:00
Vol.	1	289	44	5	12	4	1	2	2					349
PM Peak	15:00	17:00	15:00	13:00	13:00	13:00	13:00	14:00	12:00	22:00				17:00
Vol.	1	510	77	6	12	2	1	2	2	1				580



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NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	0	0	1	4	0	0	0	0	0	0	5	43	41
01:00	0	0	0	0	0	0	3	0	0	0	0	0	0	3	43	42
02:00	0	0	0	0	0	0	2	2	2	0	0	0	0	6	51	47
03:00	0	0	0	1	0	2	3	0	1	0	0	0	0	7	43	40
04:00	0	0	0	0	0	0	6	8	6	1	0	0	0	21	52	47
05:00	0	0	1	0	1	2	31	95	43	13	1	0	0	187	52	48
06:00	0	0	0	2	4	19	95	154	77	13	1	1	0	366	51	46
07:00	0	0	1	3	22	94	310	254	63	5	2	0	0	754	48	44
08:00	0	2	0	5	9	76	327	261	85	9	2	0	0	776	48	44
09:00	1	0	1	0	5	72	206	193	38	7	0	0	0	523	48	44
10:00	0	0	0	2	4	25	82	98	23	6	1	0	0	241	48	45
11:00	1	0	1	0	2	15	70	98	29	4	1	0	0	221	49	45
12 PM	0	0	2	1	0	16	49	85	41	6	0	0	0	200	51	46
13:00	0	2	0	1	7	18	54	66	20	5	0	0	0	173	48	44
14:00	0	0	0	0	1	22	56	82	41	5	2	0	0	209	51	46
15:00	0	0	0	1	10	24	80	134	46	3	0	0	0	298	49	45
16:00	0	0	0	1	4	29	127	101	28	6	0	0	0	296	48	44
17:00	0	0	0	1	6	33	135	126	33	10	0	0	0	344	48	45
18:00	0	0	0	1	4	31	85	93	18	1	0	0	0	233	48	44
19:00	0	0	0	1	6	20	44	42	15	2	1	0	0	131	48	44
20:00	0	0	0	4	1	17	25	24	7	2	0	0	0	80	48	43
21:00	0	0	0	1	2	6	18	20	9	1	0	2	0	59	50	45
22:00	0	0	0	1	3	1	10	5	6	1	0	0	0	27	51	44
23:00	0	0	0	0	0	5	17	4	5	0	0	1	0	32	50	44
Total	2	4	6	26	91	528	1839	1945	636	100	11	4	0	5192		
%	0.0%	0.1%	0.1%	0.5%	1.8%	10.2%	35.4%	37.5%	12.2%	1.9%	0.2%	0.1%	0.0%			
AM Peak	09:00	08:00	05:00	08:00	07:00	07:00	08:00	08:00	08:00	05:00	07:00	06:00		08:00		
Vol.	1	2	1	5	22	94	327	261	85	13	2	1		776		
PM Peak		13:00	12:00	20:00	15:00	17:00	17:00	15:00	15:00	17:00	14:00	21:00		17:00		
Vol.		2	2	4	10	33	135	134	46	10	2	2		344		

Stats

15th Percentile : 39 MPH
50th Percentile : 44 MPH
85th Percentile : 48 MPH
95th Percentile : 52 MPH

Mean Speed(Average) : 45 MPH
10 MPH Pace Speed : 40-49 MPH
Number in Pace : 3784
Percent in Pace : 72.9%
Number of Vehicles > 45 MPH : 2307
Percent of Vehicles > 45 MPH : 44.4%



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Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/18	0	0	0	0	0	1	2	1	0	0	0	0	0	4	46	42
01:00	0	0	0	0	0	0	2	2	2	0	0	0	0	6	51	47
02:00	0	0	0	0	1	1	2	0	1	0	0	0	0	5	50	41
03:00	0	0	0	1	0	0	3	2	2	0	0	0	0	8	51	44
04:00	0	1	0	0	0	1	4	5	6	2	0	1	0	20	54	47
05:00	0	0	0	0	1	14	34	78	31	6	0	0	0	164	50	46
06:00	0	0	0	1	7	22	76	143	58	5	1	0	0	313	50	46
07:00	0	0	0	0	14	50	231	213	63	5	1	0	0	577	48	44
08:00	0	0	1	0	6	84	255	189	47	6	1	0	1	590	48	44
09:00	0	0	2	8	20	65	138	113	24	4	1	0	0	375	47	43
10:00	0	0	4	6	17	42	94	52	12	0	0	0	0	227	46	41
11:00	0	0	1	2	9	17	78	55	16	2	0	0	0	180	48	43
12 PM	0	1	1	2	10	22	66	41	12	0	0	1	0	156	47	42
13:00	0	0	1	0	3	34	74	57	11	3	0	0	0	183	47	43
14:00	0	0	0	0	8	38	73	52	16	4	0	0	0	191	48	43
15:00	1	0	1	0	17	63	138	60	19	4	1	0	0	304	47	42
16:00	1	0	1	2	8	69	109	41	13	1	0	0	0	245	46	41
17:00	0	0	0	0	7	51	138	52	13	0	0	2	0	263	46	42
18:00	0	0	0	0	6	44	90	50	12	1	0	0	0	203	47	43
19:00	0	0	0	1	1	16	36	40	6	2	1	0	0	103	48	44
20:00	0	0	0	0	0	15	41	10	6	1	0	0	0	73	47	43
21:00	0	0	0	0	3	16	24	12	1	0	0	0	0	56	45	41
22:00	0	0	0	0	2	10	13	9	5	1	0	0	0	40	49	43
23:00	1	0	0	2	3	6	8	10	3	1	1	0	0	35	48	42
Total %	3 0.1%	2 0.0%	12 0.3%	25 0.6%	143 3.3%	681 15.8%	1729 40.0%	1287 29.8%	379 8.8%	48 1.1%	7 0.2%	4 0.1%	1 0.0%	4321		
AM Peak		04:00	10:00	09:00	09:00	08:00	08:00	07:00	07:00	05:00	06:00	04:00	08:00	08:00		
Vol.		1	4	8	20	84	255	213	63	6	1	1	1	590		
PM Peak	15:00	12:00	12:00	12:00	15:00	16:00	15:00	15:00	15:00	14:00	15:00	17:00		15:00		
Vol.	1	1	1	2	17	69	138	60	19	4	1	2		304		

Stats

15th Percentile : 37 MPH

50th Percentile : 42 MPH

85th Percentile : 48 MPH

95th Percentile : 51 MPH

Mean Speed(Average) : 43 MPH

10 MPH Pace Speed : 40-49 MPH

Number in Pace : 3016

Percent in Pace : 69.8%

Number of Vehicles > 45 MPH : 1469

Percent of Vehicles > 45 MPH : 34.0%



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Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/																
18	0	0	0	0	1	3	3	2	2	0	0	0	0	11	49	42
01:00	0	0	0	0	0	3	1	1	1	0	0	0	0	6	49	42
02:00	0	0	0	0	0	1	1	2	1	0	0	0	0	5	50	45
03:00	0	0	0	0	0	2	1	0	0	0	0	0	0	3	41	39
04:00	0	0	0	0	0	2	1	2	1	0	0	0	0	6	49	44
05:00	0	1	0	0	0	2	8	8	3	0	0	0	0	22	48	44
06:00	0	0	0	0	1	3	13	15	9	4	0	0	0	45	52	46
07:00	0	0	0	0	0	9	39	37	13	3	0	0	0	101	49	45
08:00	0	0	0	1	4	11	56	45	19	2	0	0	0	138	49	44
09:00	0	1	0	1	2	22	55	60	22	1	0	0	0	164	48	44
10:00	0	0	0	2	6	21	97	41	12	1	0	0	0	180	47	43
11:00	0	0	0	1	9	42	82	47	26	1	0	0	0	208	48	43
12 PM	0	0	0	2	2	31	83	74	27	0	0	0	0	219	48	44
13:00	0	0	0	1	8	14	76	64	21	1	0	0	0	185	48	44
14:00	1	0	1	2	2	25	81	61	18	1	0	0	0	192	48	43
15:00	0	0	0	1	0	13	84	46	23	2	0	0	0	169	48	44
16:00	0	0	0	1	2	21	57	69	18	1	0	0	0	169	48	44
17:00	0	0	0	0	1	14	59	54	19	3	0	0	0	150	48	45
18:00	0	0	0	4	7	10	56	35	16	1	0	0	0	129	48	43
19:00	0	1	0	0	4	10	36	22	7	1	1	0	0	82	48	43
20:00	0	0	0	1	5	10	27	16	2	0	1	0	0	62	47	42
21:00	0	0	0	0	2	10	22	8	3	0	0	0	0	45	46	42
22:00	0	0	0	0	1	10	20	8	2	0	2	0	0	43	47	43
23:00	0	0	0	0	0	6	15	10	3	3	0	0	0	37	49	45
Total	1	3	1	17	57	295	973	727	268	25	4	0	0	2371		
%	0.0%	0.1%	0.0%	0.7%	2.4%	12.4%	41.0%	30.7%	11.3%	1.1%	0.2%	0.0%	0.0%			
AM																
Peak		05:00		10:00	11:00	11:00	10:00	09:00	11:00	06:00				11:00		
Vol.		1		2	9	42	97	60	26	4				208		
PM																
Peak	14:00	19:00	14:00	18:00	13:00	12:00	15:00	12:00	12:00	17:00	22:00			12:00		
Vol.	1	1	1	4	8	31	84	74	27	3	2			219		

Stats

15th Percentile : 38 MPH
50th Percentile : 43 MPH
85th Percentile : 48 MPH
95th Percentile : 52 MPH

Mean Speed(Average) : 44 MPH
10 MPH Pace Speed : 40-49 MPH
Number in Pace : 1700
Percent in Pace : 71.7%
Number of Vehicles > 45 MPH : 879
Percent of Vehicles > 45 MPH : 37.1%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	1	3	5	5	1	0	0	0	0	15	47	43
01:00	0	0	0	0	1	0	3	2	1	0	0	0	0	7	48	43
02:00	0	0	0	0	0	3	4	2	0	1	0	0	0	10	47	43
03:00	0	0	0	0	0	0	1	0	1	0	0	0	0	2	52	47
04:00	0	0	0	0	0	1	0	0	0	2	0	0	0	3	57	50
05:00	0	1	0	0	0	1	1	4	0	0	0	0	0	7	47	41
06:00	0	0	0	0	0	1	8	10	4	1	0	0	0	24	50	46
07:00	0	0	1	0	0	8	18	28	5	3	0	0	0	63	48	45
08:00	0	0	0	2	5	19	43	40	8	2	1	0	0	120	48	43
09:00	0	0	0	0	3	23	67	41	5	1	0	0	0	140	47	43
10:00	0	0	0	2	4	20	83	61	7	4	0	0	0	181	47	43
11:00	0	2	4	2	6	10	70	48	7	2	0	0	0	151	47	42
12 PM	0	0	0	1	9	26	96	50	18	2	0	0	0	202	47	43
13:00	0	0	0	4	7	24	76	80	16	3	0	0	0	210	48	44
14:00	0	0	1	0	4	34	58	54	11	2	0	0	0	164	47	43
15:00	0	0	1	3	5	16	56	52	12	2	0	0	0	147	48	43
16:00	0	0	0	0	7	17	64	43	8	1	0	0	0	140	47	43
17:00	0	0	0	1	0	14	55	49	11	3	0	0	0	133	48	44
18:00	0	0	0	0	2	17	59	37	10	0	0	0	0	125	47	43
19:00	0	0	0	0	2	17	41	22	8	0	1	0	0	91	47	43
20:00	0	0	0	2	3	11	27	24	1	0	0	0	0	68	47	42
21:00	0	0	0	1	0	8	16	8	4	0	0	0	0	37	48	43
22:00	0	0	0	0	3	7	6	3	4	2	1	0	0	26	52	44
23:00	0	0	0	1	1	2	7	5	0	0	1	0	0	17	47	43
Total	0	3	7	19	63	282	864	668	142	31	4	0	0	2083		
%	0.0%	0.1%	0.3%	0.9%	3.0%	13.5%	41.5%	32.1%	6.8%	1.5%	0.2%	0.0%	0.0%			
AM Peak		11:00	11:00	08:00	11:00	09:00	10:00	10:00	08:00	10:00	08:00			10:00		
Vol.		2	4	2	6	23	83	61	8	4	1			181		
PM Peak			14:00	13:00	12:00	14:00	12:00	13:00	12:00	13:00	19:00			13:00		
Vol.			1	4	9	34	96	80	18	3	1			210		

Stats

15th Percentile : 37 MPH
50th Percentile : 42 MPH
85th Percentile : 47 MPH
95th Percentile : 51 MPH

Mean Speed(Average) : 43 MPH
10 MPH Pace Speed : 40-49 MPH
Number in Pace : 1532
Percent in Pace : 73.5%
Number of Vehicles > 45 MPH : 711
Percent of Vehicles > 45 MPH : 34.2%



PRECISION
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11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	1	3	3	1	2	0	0	0	0	10	50	42
01:00	0	0	0	0	0	1	2	0	1	0	0	0	0	4	51	43
02:00	0	0	0	0	0	0	1	1	0	0	0	0	0	2	47	45
03:00	0	0	0	0	0	0	2	1	0	0	0	0	0	3	46	44
04:00	0	0	0	0	0	2	3	12	1	2	0	0	0	20	49	46
05:00	0	1	0	0	2	17	41	80	35	9	1	0	0	186	51	46
06:00	0	0	0	0	3	45	145	144	26	3	1	0	0	367	48	44
07:00	0	0	1	3	19	157	369	171	20	1	0	0	0	741	46	42
08:00	0	0	0	13	24	217	347	155	38	3	0	0	0	797	46	42
09:00	0	0	0	1	19	91	172	84	19	2	0	0	0	388	46	42
10:00	0	0	0	1	3	20	71	80	17	5	1	1	0	199	48	45
11:00	0	0	0	1	3	22	62	63	21	3	0	0	0	175	48	44
12 PM	0	0	0	1	4	10	73	74	20	1	0	0	0	183	48	45
13:00	0	0	2	2	3	22	47	58	18	5	0	0	0	157	48	44
14:00	0	0	0	0	0	22	53	66	16	8	0	0	0	165	48	45
15:00	0	0	1	1	1	25	104	87	32	0	0	1	1	253	48	44
16:00	1	0	0	3	2	20	139	92	14	1	1	0	0	273	47	44
17:00	0	0	0	0	3	35	166	94	14	0	0	0	0	312	47	43
18:00	0	1	0	0	4	20	99	49	9	0	0	0	0	182	47	43
19:00	0	0	0	1	5	16	42	42	8	3	0	0	0	117	48	44
20:00	0	0	0	1	4	15	28	12	5	0	0	0	0	65	47	42
21:00	0	0	1	0	0	9	24	12	5	2	0	0	0	53	48	43
22:00	0	0	0	0	0	7	5	6	2	0	1	0	0	21	48	44
23:00	0	0	0	1	1	6	7	2	4	3	1	0	0	25	54	44
Total	1	2	5	29	101	782	2005	1386	327	51	6	2	1	4698		
%	0.0%	0.0%	0.1%	0.6%	2.1%	16.6%	42.7%	29.5%	7.0%	1.1%	0.1%	0.0%	0.0%			
AM Peak		05:00	07:00	08:00	08:00	08:00	07:00	07:00	08:00	05:00	05:00	10:00		08:00		
Vol.		1	1	13	24	217	369	171	38	9	1	1		797		
PM Peak	16:00	18:00	13:00	16:00	19:00	17:00	17:00	17:00	15:00	14:00	16:00	15:00	15:00	17:00		
Vol.	1	1	2	3	5	35	166	94	32	8	1	1	1	312		

Stats

15th Percentile : 37 MPH
50th Percentile : 42 MPH
85th Percentile : 47 MPH
95th Percentile : 51 MPH

Mean Speed(Average) : 43 MPH
10 MPH Pace Speed : 40-49 MPH
Number in Pace : 3391
Percent in Pace : 72.2%
Number of Vehicles > 45 MPH : 1496
Percent of Vehicles > 45 MPH : 31.8%



PRECISION
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11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

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176038 C Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	0	1	0	4	1	0	0	0	0	0	6	44	41
01:00	0	0	0	0	0	0	2	2	1	0	0	0	0	5	50	46
02:00	0	0	0	0	0	0	1	2	2	0	0	0	0	5	52	48
03:00	0	0	0	0	0	0	1	2	0	0	0	0	0	3	47	45
04:00	0	0	0	0	0	2	5	15	3	2	0	0	0	27	50	47
05:00	0	1	0	1	0	6	61	87	39	7	0	1	0	203	51	46
06:00	0	0	0	4	35	96	161	112	19	4	0	0	0	431	47	42
07:00	0	0	0	4	41	169	397	187	24	3	1	0	0	826	46	42
08:00	0	0	1	2	11	140	339	154	21	2	2	0	0	672	46	42
09:00	0	0	0	0	6	59	265	106	15	0	0	0	0	451	46	43
10:00	0	0	0	0	3	31	91	85	16	2	0	0	0	228	48	44
11:00	0	0	0	0	3	35	86	44	4	3	0	0	0	175	46	43
12 PM	0	0	0	1	9	20	91	63	16	1	0	0	0	201	47	43
13:00	0	0	1	2	1	32	78	37	15	0	0	0	0	166	47	43
14:00	0	0	0	0	3	18	77	59	12	1	0	0	0	170	47	44
15:00	0	0	0	0	13	65	121	57	15	3	0	0	0	274	46	42
16:00	0	0	2	4	5	52	151	83	17	1	0	0	0	315	47	43
17:00	0	0	0	0	8	47	162	73	18	1	0	0	0	309	47	43
18:00	0	0	0	0	4	27	108	64	11	1	2	0	0	217	47	43
19:00	0	0	0	1	5	27	34	25	4	0	1	0	0	97	47	42
20:00	0	0	0	0	4	14	38	10	4	1	0	0	0	71	46	42
21:00	0	0	0	0	5	13	19	14	2	0	0	0	0	53	46	42
22:00	0	0	0	0	1	5	14	11	1	0	0	0	0	32	47	43
23:00	0	1	0	1	0	2	6	6	1	1	0	0	0	18	48	42
Total	0	2	4	20	158	860	2312	1299	260	33	6	1	0	4955		
%	0.0%	0.0%	0.1%	0.4%	3.2%	17.4%	46.7%	26.2%	5.2%	0.7%	0.1%	0.0%	0.0%			
AM Peak		05:00	08:00	06:00	07:00	07:00	07:00	07:00	05:00	05:00	08:00	05:00		07:00		
Vol.		1	1	4	41	169	397	187	39	7	2	1		826		
PM Peak		23:00	16:00	16:00	15:00	15:00	17:00	16:00	17:00	15:00	18:00			16:00		
Vol.		1	2	4	13	65	162	83	18	3	2			315		

Stats

15th Percentile : 37 MPH
50th Percentile : 42 MPH
85th Percentile : 47 MPH
95th Percentile : 50 MPH

Mean Speed(Average) : 43 MPH
10 MPH Pace Speed : 40-49 MPH
Number in Pace : 3611
Percent in Pace : 72.9%
Number of Vehicles > 45 MPH : 1339
Percent of Vehicles > 45 MPH : 27.0%



PRECISION
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11 Cambridge Turnpike Cutoff

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176038 C Speed

Site Code: TBA

NB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	0	0	3	2	0	0	0	0	0	0	5	42	39
01:00	0	0	0	0	0	0	0	0	1	0	0	0	0	1	53	52
02:00	0	0	0	0	0	1	3	5	1	0	0	0	0	10	48	45
03:00	0	0	1	1	0	2	1	1	1	0	0	0	0	7	48	38
04:00	0	0	1	0	0	0	9	8	4	3	1	0	0	26	54	47
05:00	0	0	0	0	2	8	43	97	33	2	0	0	0	185	50	46
06:00	0	0	0	0	22	42	157	130	23	3	1	0	0	378	47	43
07:00	0	0	0	0	16	177	448	170	25	1	0	0	0	837	46	42
08:00	0	0	0	5	25	128	314	195	28	8	1	0	1	705	47	43
09:00	0	0	0	4	5	48	184	133	26	3	0	0	0	403	47	44
10:00	0	0	0	0	3	41	112	69	9	3	0	0	0	237	47	43
11:00	0	1	0	2	3	33	59	68	17	1	0	0	0	184	48	43
12 PM	0	0	1	0	9	43	88	57	15	0	0	0	0	213	47	43
13:00	0	0	0	0	3	28	95	58	10	1	0	0	0	195	47	43
14:00	0	0	1	1	5	20	56	74	17	2	0	0	0	176	48	44
15:00	0	0	1	2	4	47	136	89	10	0	0	0	0	289	47	43
16:00	1	0	0	4	7	57	102	78	8	2	0	0	0	259	47	42
17:00	0	0	2	1	5	38	179	107	12	1	1	0	0	346	47	43
18:00	0	0	0	3	12	42	87	70	15	0	0	0	1	230	47	43
19:00	0	0	0	0	8	23	54	37	7	1	0	0	0	130	47	43
20:00	0	0	0	1	8	18	40	20	4	0	0	0	0	91	46	42
21:00	0	0	0	0	4	11	19	14	6	1	0	0	0	55	48	43
22:00	0	0	0	0	1	10	15	11	2	3	1	0	0	43	48	44
23:00	0	0	0	0	0	4	3	6	2	0	1	0	0	16	50	45
Total	1	1	7	24	142	824	2206	1497	276	35	6	0	2	5021		
%	0.0%	0.0%	0.1%	0.5%	2.8%	16.4%	43.9%	29.8%	5.5%	0.7%	0.1%	0.0%	0.0%			
AM Peak		11:00	03:00	08:00	08:00	07:00	07:00	08:00	05:00	08:00	04:00		08:00	07:00		
Vol.		1	1	5	25	177	448	195	33	8	1		1	837		
PM Peak	16:00		17:00	16:00	18:00	16:00	17:00	17:00	14:00	22:00	17:00		18:00	17:00		
Vol.	1		2	4	12	57	179	107	17	3	1		1	346		

Stats

15th Percentile : 37 MPH

50th Percentile : 42 MPH

85th Percentile : 47 MPH

95th Percentile : 50 MPH

Mean Speed(Average) : 43 MPH

10 MPH Pace Speed : 40-49 MPH

Number in Pace : 3703

Percent in Pace : 73.8%

Number of Vehicles > 45 MPH : 1517

Percent of Vehicles > 45 MPH : 30.2%



PRECISION
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SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	0	1	2	3	2	0	0	0	0	0	8	46	41
01:00	0	0	0	0	1	3	6	3	0	0	0	0	0	13	45	41
02:00	0	0	0	0	0	1	2	3	0	0	0	0	0	6	47	44
03:00	0	0	0	0	0	3	0	0	1	1	0	0	0	5	55	44
04:00	0	0	0	0	1	2	3	2	1	0	0	0	0	9	48	42
05:00	0	0	0	0	1	5	16	10	7	1	0	0	0	40	50	44
06:00	0	0	0	0	3	35	64	44	4	0	1	0	0	151	46	42
07:00	0	1	5	2	11	62	133	56	8	0	0	0	0	278	45	41
08:00	0	0	0	2	14	83	179	74	10	1	0	0	0	363	46	42
09:00	0	0	0	0	4	50	136	46	4	1	0	0	0	241	45	42
10:00	0	0	0	1	5	43	95	41	7	1	0	0	0	193	46	42
11:00	0	0	0	2	3	65	99	39	8	1	1	0	0	218	46	42
12 PM	0	0	0	2	6	54	124	58	10	1	0	0	0	255	46	42
13:00	0	0	0	4	8	57	106	55	2	1	0	0	0	233	46	42
14:00	0	0	0	1	7	55	175	89	16	2	0	1	0	346	47	43
15:00	0	0	0	5	24	136	216	112	7	0	1	0	0	501	46	41
16:00	0	0	0	0	17	107	283	109	18	0	0	0	0	534	46	42
17:00	0	0	0	2	22	152	285	77	8	1	0	0	0	547	44	41
18:00	0	0	0	2	9	58	193	81	6	0	0	0	0	349	46	42
19:00	0	0	2	3	15	54	103	29	3	1	0	0	0	210	44	40
20:00	0	0	0	5	5	47	59	17	4	1	0	0	0	138	44	40
21:00	0	0	1	1	7	41	47	21	1	0	0	0	0	119	44	40
22:00	0	0	0	1	3	8	17	12	5	1	0	0	0	47	48	43
23:00	0	0	0	0	1	6	8	9	6	0	0	0	0	30	50	44
Total	0	1	8	33	168	1129	2352	989	136	14	3	1	0	4834		
%	0.0%	0.0%	0.2%	0.7%	3.5%	23.4%	48.7%	20.5%	2.8%	0.3%	0.1%	0.0%	0.0%			
AM Peak		07:00	07:00	07:00	08:00	08:00	08:00	08:00	08:00	03:00	06:00			08:00		
Vol.		1	5	2	14	83	179	74	10	1	1			363		
PM Peak			19:00	15:00	15:00	17:00	17:00	15:00	16:00	14:00	15:00	14:00		17:00		
Vol.			2	5	24	152	285	112	18	2	1	1		547		

Stats

15th Percentile : 36 MPH
50th Percentile : 41 MPH
85th Percentile : 46 MPH
95th Percentile : 48 MPH

Mean Speed(Average) : 42 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 3481
Percent in Pace : 72.0%
Number of Vehicles > 45 MPH : 945
Percent of Vehicles > 45 MPH : 19.6%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Speed

Site Code: TBA

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/18	0	0	0	0	1	4	5	5	1	0	0	0	0	16	47	42
01:00	0	0	0	0	0	4	3	2	2	0	0	0	0	11	49	43
02:00	0	0	0	0	0	4	1	1	0	1	0	0	0	7	48	42
03:00	0	0	0	0	1	1	1	0	1	0	0	0	0	4	51	41
04:00	0	0	0	0	0	0	4	2	0	1	0	0	0	7	48	46
05:00	0	0	0	0	1	7	19	14	2	2	0	0	0	45	48	44
06:00	0	0	0	0	3	30	63	37	9	0	0	1	0	143	47	43
07:00	0	0	0	0	5	59	130	74	4	0	0	0	0	272	46	42
08:00	0	0	1	2	16	56	151	81	9	1	0	0	0	317	46	42
09:00	0	1	1	0	6	63	111	36	3	0	0	0	0	221	44	41
10:00	1	1	2	4	19	46	77	22	2	0	0	0	0	174	43	39
11:00	0	0	1	1	17	61	87	24	2	0	0	0	0	193	43	40
12 PM	0	0	0	8	14	70	94	26	5	0	0	0	0	217	43	40
13:00	0	0	2	2	14	77	109	33	2	0	0	0	0	239	43	40
14:00	0	2	0	3	21	132	189	51	2	0	0	0	0	400	43	40
15:00	0	0	0	2	19	136	229	50	4	1	1	0	0	442	43	41
16:00	0	0	4	1	20	180	264	75	13	2	1	0	0	560	44	41
17:00	0	0	1	2	21	198	316	76	5	0	1	0	0	620	43	41
18:00	0	0	0	2	18	81	181	44	9	0	0	0	0	335	44	41
19:00	0	0	1	1	14	61	67	12	0	0	0	0	0	156	43	39
20:00	0	0	0	1	14	35	35	4	1	0	0	0	0	90	42	39
21:00	0	0	0	0	21	27	28	6	2	0	0	0	0	84	43	38
22:00	0	0	0	1	5	41	39	5	0	0	0	0	0	91	42	39
23:00	0	0	0	1	5	19	18	6	0	0	0	0	0	49	43	39
Total	1	4	13	31	255	1392	2221	686	78	8	3	1	0	4693		
%	0.0%	0.1%	0.3%	0.7%	5.4%	29.7%	47.3%	14.6%	1.7%	0.2%	0.1%	0.0%	0.0%			
AM Peak	10:00	09:00	10:00	10:00	10:00	09:00	08:00	08:00	06:00	05:00		06:00		08:00		
Vol.	1	1	2	4	19	63	151	81	9	2		1		317		
PM Peak		14:00	16:00	12:00	14:00	17:00	17:00	17:00	16:00	16:00	15:00			17:00		
Vol.		2	4	8	21	198	316	76	13	2	1			620		

Stats

15th Percentile : 35 MPH

50th Percentile : 40 MPH

85th Percentile : 44 MPH

95th Percentile : 47 MPH

Mean Speed(Average) : 41 MPH

10 MPH Pace Speed : 35-44 MPH

Number in Pace : 3613

Percent in Pace : 77.0%

Number of Vehicles > 45 MPH : 639

Percent of Vehicles > 45 MPH : 13.6%



PRECISION
D A T A
INDUSTRIES, LLC

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11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Speed

Site Code: TBA

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/ 18	0	0	0	0	1	10	8	4	0	0	0	0	0	23	44	40
01:00	0	0	0	0	3	3	4	0	0	0	0	0	0	10	42	38
02:00	0	0	0	0	0	8	6	0	0	0	0	0	0	14	42	39
03:00	0	0	0	0	0	0	1	0	1	0	0	0	0	2	52	47
04:00	0	0	0	0	0	2	2	0	1	0	0	0	0	5	50	42
05:00	0	0	0	0	1	1	1	4	2	1	0	0	0	10	52	46
06:00	0	0	0	0	1	21	29	19	4	0	0	0	0	74	47	42
07:00	0	0	0	1	4	22	24	10	4	0	1	0	0	66	46	41
08:00	0	0	0	0	5	29	62	15	2	0	0	0	0	113	44	41
09:00	0	0	0	1	6	30	48	28	4	0	0	0	0	117	46	42
10:00	0	0	1	2	7	39	100	28	1	0	0	0	0	178	44	41
11:00	0	0	0	1	11	56	102	32	4	0	0	0	0	206	44	41
12 PM	0	0	0	2	10	59	109	34	1	1	1	0	0	217	44	41
13:00	0	0	0	0	9	57	95	66	2	3	0	0	0	232	46	42
14:00	0	0	0	1	7	61	135	41	4	0	0	0	0	249	44	41
15:00	0	0	2	3	7	66	127	39	2	0	1	0	0	247	44	41
16:00	0	0	0	1	13	61	115	39	2	0	0	0	0	231	44	41
17:00	0	0	1	2	9	40	74	31	1	0	0	0	0	158	45	41
18:00	0	0	0	4	13	48	67	27	3	1	0	0	0	163	45	40
19:00	0	1	0	1	7	59	53	15	0	0	0	0	0	136	43	40
20:00	0	0	0	0	5	27	50	10	1	0	0	0	0	93	43	41
21:00	0	0	0	0	9	20	35	9	1	0	0	0	0	74	43	40
22:00	0	0	0	0	3	31	43	16	0	0	0	0	0	93	44	41
23:00	0	0	0	0	0	12	18	6	1	0	0	0	0	37	45	41
Total %	0 0.0%	1 0.0%	4 0.1%	19 0.7%	131 4.8%	762 27.7%	1308 47.6%	473 17.2%	41 1.5%	6 0.2%	3 0.1%	0 0.0%	0 0.0%	2748		
AM Peak			10:00	10:00	11:00	11:00	11:00	11:00	06:00	05:00	07:00			11:00		
Vol.			1	2	11	56	102	32	4	1	1			206		
PM Peak		19:00	15:00	18:00	16:00	15:00	14:00	13:00	14:00	13:00	12:00			14:00		
Vol.		1	2	4	13	66	135	66	4	3	1			249		

Stats

15th Percentile : 35 MPH
50th Percentile : 40 MPH
85th Percentile : 45 MPH
95th Percentile : 48 MPH

Mean Speed(Average) : 41 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 2070
Percent in Pace : 75.3%
Number of Vehicles > 45 MPH : 428
Percent of Vehicles > 45 MPH : 15.6%



PRECISION
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INDUSTRIES, LLC

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176038 C Speed

Site Code: TBA

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	1	0	4	10	8	1	1	0	0	0	25	47	43
01:00	0	0	0	0	0	6	10	4	0	0	0	0	0	20	45	42
02:00	0	0	0	0	1	2	5	2	0	0	0	0	0	10	45	41
03:00	0	0	0	0	0	0	2	1	0	0	0	0	0	3	46	44
04:00	0	0	0	0	0	0	2	1	1	2	0	0	0	6	56	49
05:00	0	0	0	1	1	2	3	2	1	0	1	0	0	11	50	42
06:00	0	2	0	1	1	8	24	9	4	0	0	0	0	49	47	41
07:00	0	0	0	0	2	5	32	9	3	1	0	0	0	52	46	43
08:00	0	0	2	1	6	17	27	20	4	0	0	0	0	77	47	41
09:00	0	0	0	1	4	19	44	26	2	0	0	0	0	96	46	42
10:00	0	0	0	0	6	39	84	24	4	1	0	1	0	159	45	42
11:00	0	0	0	1	15	46	69	27	2	0	1	0	0	161	45	41
12 PM	0	0	0	0	13	57	134	38	4	1	0	0	0	247	44	41
13:00	0	0	0	0	9	66	124	36	3	1	0	0	0	239	44	41
14:00	0	0	1	2	11	68	91	20	4	0	0	0	0	197	43	40
15:00	0	1	1	3	8	64	101	28	3	0	0	0	0	209	43	40
16:00	0	0	0	0	9	51	67	24	5	0	0	0	0	156	45	41
17:00	0	0	0	0	5	36	76	26	3	0	0	0	0	146	45	42
18:00	0	0	0	0	7	39	60	23	4	0	0	0	0	133	45	41
19:00	0	0	1	2	5	32	47	18	0	0	1	0	0	106	44	41
20:00	0	0	0	0	9	27	41	8	2	0	0	0	0	87	43	40
21:00	0	0	0	2	0	15	24	6	0	0	0	1	0	48	43	41
22:00	0	0	1	2	1	13	20	6	1	0	0	0	0	44	44	40
23:00	0	0	0	1	0	5	5	3	1	0	0	0	0	15	46	41
Total	0	3	6	18	113	621	1102	369	52	7	3	2	0	2296		
%	0.0%	0.1%	0.3%	0.8%	4.9%	27.0%	48.0%	16.1%	2.3%	0.3%	0.1%	0.1%	0.0%			
AM Peak		06:00	08:00	00:00	11:00	11:00	10:00	11:00	06:00	04:00	05:00	10:00		11:00		
Vol.		2	2	1	15	46	84	27	4	2	1	1		161		
PM Peak		15:00	14:00	15:00	12:00	14:00	12:00	12:00	16:00	12:00	19:00	21:00		12:00		
Vol.		1	1	3	13	68	134	38	5	1	1	1		247		

Stats

15th Percentile : 35 MPH
50th Percentile : 40 MPH
85th Percentile : 45 MPH
95th Percentile : 48 MPH

Mean Speed(Average) : 41 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 1723
Percent in Pace : 75.0%
Number of Vehicles > 45 MPH : 359
Percent of Vehicles > 45 MPH : 15.6%



PRECISION
D A T A
INDUSTRIES, LLC

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11 Cambridge Turnpike Cutoff
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City, State: Lincoln, MA

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176038 C Speed

Site Code: TBA

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	0	3	7	2	1	0	0	0	0	13	46	42
01:00	0	0	0	0	0	1	5	0	0	0	0	0	0	6	43	41
02:00	0	0	0	0	0	2	0	0	1	0	0	0	0	3	51	42
03:00	0	0	0	0	0	2	0	1	1	0	0	0	0	4	51	43
04:00	0	0	0	0	0	0	6	0	0	0	0	0	0	6	43	42
05:00	0	0	0	0	1	16	14	8	4	0	0	0	0	43	47	42
06:00	0	0	0	0	1	22	79	39	8	0	0	0	0	149	47	43
07:00	0	0	0	8	15	83	136	46	2	2	0	0	0	292	44	41
08:00	0	0	0	4	19	122	153	45	3	0	0	0	0	346	43	40
09:00	0	0	0	0	5	75	154	53	4	0	0	0	0	291	45	42
10:00	0	1	0	5	7	40	94	32	0	0	0	0	0	179	44	41
11:00	0	0	1	2	9	53	87	36	0	0	0	0	0	188	45	41
12 PM	0	0	1	1	7	54	107	32	4	2	0	0	0	208	45	41
13:00	0	1	1	0	5	62	120	45	1	0	0	0	0	235	45	41
14:00	0	0	2	7	9	45	173	72	8	2	1	0	0	319	46	42
15:00	0	1	1	1	8	94	215	81	12	1	0	0	0	414	45	42
16:00	0	1	4	8	14	108	253	93	10	0	0	0	0	491	45	41
17:00	0	0	0	0	14	106	270	84	7	0	0	0	0	481	45	42
18:00	0	0	0	2	8	74	175	80	9	2	0	0	0	350	46	42
19:00	0	0	0	2	6	55	108	16	2	0	0	0	0	189	43	41
20:00	0	0	0	1	2	35	54	24	2	0	0	0	0	118	45	41
21:00	0	0	0	0	4	31	38	6	2	0	0	0	0	81	43	40
22:00	0	0	0	0	4	8	22	8	3	1	0	0	0	46	47	42
23:00	0	0	0	1	1	2	14	11	3	0	0	0	0	32	48	44
Total %	0 0.0%	4 0.1%	10 0.2%	42 0.9%	139 3.1%	1093 24.4%	2284 50.9%	814 18.2%	87 1.9%	10 0.2%	1 0.0%	0 0.0%	0 0.0%	4484		
AM Peak	10:00	11:00	07:00	08:00	08:00	09:00	09:00	06:00	07:00					08:00		
Vol.	1	1	8	19	122	154	53	8	2					346		
PM Peak	13:00	16:00	16:00	16:00	16:00	17:00	16:00	15:00	12:00	14:00				16:00		
Vol.	1	4	8	14	108	270	93	12	2	1				491		

Stats

15th Percentile : 36 MPH
50th Percentile : 41 MPH
85th Percentile : 45 MPH
95th Percentile : 48 MPH

Mean Speed(Average) : 41 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 3377
Percent in Pace : 75.3%
Number of Vehicles > 45 MPH : 749
Percent of Vehicles > 45 MPH : 16.7%



PRECISION
D A T A
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176038 C Speed

Site Code: TBA

SB

Start Time	14	15	19	20	24	25	29	30	34	35	39	40	44	45	49	50	54	55	59	60	64	65	69	70	9999	Total	85th %ile	Ave Speed
04/10/																												
18	0	0	0	0	0	0	0	0	0	2	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9	43	41
01:00	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	38	37
02:00	0	0	0	0	0	0	0	2	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	39	36
03:00	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	42	40
04:00	0	0	0	0	1	0	2	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	48	44
05:00	0	0	0	0	1	1	12	14	14	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	47	42
06:00	0	0	0	1	2	11	37	60	35	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	153	46	41
07:00	0	0	0	2	3	9	89	131	48	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	288	45	41
08:00	0	0	0	1	4	44	118	137	33	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	339	43	39
09:00	0	0	0	0	2	12	74	136	49	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	279	45	41
10:00	0	0	0	0	0	7	57	94	33	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194	45	41
11:00	0	0	0	0	1	7	51	89	30	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	179	44	41
12 PM	0	0	0	1	1	2	64	131	23	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	224	43	41
13:00	0	0	0	2	5	8	67	95	29	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	211	44	40
14:00	0	0	0	3	5	7	90	180	63	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	356	45	41
15:00	0	0	0	4	4	17	174	254	44	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	43	40
16:00	1	0	0	0	2	19	146	300	79	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	551	44	41
17:00	0	1	1	1	3	8	121	297	82	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	521	44	41
18:00	0	0	0	0	0	7	90	184	64	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	348	45	42
19:00	0	0	0	0	0	5	66	79	32	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	185	45	41
20:00	0	0	0	0	0	6	34	62	15	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	119	43	41
21:00	0	0	0	0	0	4	32	58	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	44	41
22:00	0	0	0	0	0	1	12	19	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	45	41
23:00	0	0	0	0	0	2	7	12	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	47	42
Total	1	1	15	34	179	1350	2343	710	61	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4704		
%	0.0%	0.0%	0.3%	0.7%	3.8%	28.7%	49.8%	15.1%	1.3%	0.1%	0.1%	0.0%	0.0%															
AM Peak			07:00	08:00	08:00	08:00	08:00	08:00	09:00	06:00	06:00	04:00														08:00		
Vol.			2	4	44	118	137	49	6	1	1															339		
PM Peak	16:00	17:00	15:00	13:00	16:00	15:00	16:00	17:00	14:00	14:00	13:00															16:00		
Vol.	1	1	4	5	19	174	300	82	7	1	1															551		

Stats

15th Percentile : 35 MPH
50th Percentile : 40 MPH
85th Percentile : 44 MPH
95th Percentile : 47 MPH

Mean Speed(Average) : 41 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 3693
Percent in Pace : 78.5%
Number of Vehicles > 45 MPH : 639
Percent of Vehicles > 45 MPH : 13.6%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

11 Cambridge Turnpike Cutoff
south of Lexington Road

City, State: Lincoln, MA

Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Speed

Site Code: TBA

SB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	0	0	2	6	1	3	0	0	0	0	12	51	44
01:00	0	0	0	0	0	3	1	2	0	0	0	0	0	6	46	41
02:00	0	0	0	0	0	1	2	0	0	0	0	0	0	3	42	40
03:00	0	0	0	0	2	1	1	0	0	0	0	0	0	4	41	36
04:00	0	0	0	0	0	1	5	0	1	0	0	0	0	7	43	43
05:00	0	0	0	0	1	9	26	16	2	0	0	0	0	54	47	43
06:00	0	0	1	3	8	38	63	32	7	0	0	1	0	153	46	41
07:00	0	0	0	1	14	84	141	41	2	0	0	0	0	283	44	41
08:00	0	0	0	2	17	159	139	30	2	0	0	0	0	349	43	40
09:00	0	0	0	8	20	72	148	48	2	0	0	0	0	298	44	41
10:00	0	0	1	1	13	42	87	46	5	0	0	0	0	195	46	42
11:00	0	0	0	5	17	54	106	36	2	0	0	0	0	220	44	41
12 PM	0	0	1	0	13	69	110	47	5	0	1	0	0	246	45	41
13:00	0	0	1	1	9	48	140	44	7	0	0	0	0	250	45	42
14:00	0	0	0	0	7	81	195	71	4	1	1	0	0	360	45	42
15:00	0	0	2	7	11	96	242	90	9	0	0	0	0	457	45	42
16:00	0	0	1	5	15	129	291	105	11	1	0	0	0	558	45	42
17:00	0	1	3	3	27	149	298	91	7	1	0	0	0	580	44	41
18:00	0	0	1	1	9	82	203	75	6	1	0	0	0	378	45	42
19:00	0	0	5	5	21	80	113	22	0	0	0	0	0	246	43	39
20:00	0	0	0	0	9	69	50	14	1	0	0	0	0	143	43	40
21:00	0	0	0	0	4	29	59	14	3	1	0	0	0	110	44	41
22:00	0	0	0	0	5	19	28	8	1	0	0	0	0	61	43	40
23:00	0	0	0	0	2	5	19	6	2	0	0	0	0	34	46	42
Total	0	1	16	42	224	1322	2473	839	82	5	2	1	0	5007		
%	0.0%	0.0%	0.3%	0.8%	4.5%	26.4%	49.4%	16.8%	1.6%	0.1%	0.0%	0.0%	0.0%			
AM Peak			06:00	09:00	09:00	08:00	09:00	09:00	06:00			06:00		08:00		
Vol.			1	8	20	159	148	48	7			1		349		
PM Peak		17:00	19:00	15:00	17:00	17:00	17:00	16:00	16:00	14:00	12:00			17:00		
Vol.		1	5	7	27	149	298	105	11	1	1			580		

Stats

15th Percentile : 35 MPH
50th Percentile : 40 MPH
85th Percentile : 45 MPH
95th Percentile : 48 MPH

Mean Speed(Average) : 41 MPH
10 MPH Pace Speed : 35-44 MPH
Number in Pace : 3795
Percent in Pace : 75.8%
Number of Vehicles > 45 MPH : 761
Percent of Vehicles > 45 MPH : 15.2%



PRECISION
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11 Cambridge Turnpike Cutoff
south of Lexington Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Volume
Site Code: TBA

Start	NB		SB		Combin		4/5/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Thu	
12:00	0	55	1	62	1	117		
12:15	2	53	4	52	6	105		
12:30	2	51	2	78	4	129		
12:45	1	41	1	63	2	104	455	
01:00	1	30	5	52	6	82		
01:15	0	56	0	54	0	110		
01:30	1	47	1	66	2	113		
01:45	1	40	7	61	8	101	406	
02:00	2	40	0	78	2	118		
02:15	1	60	2	75	3	135		
02:30	0	58	2	108	2	166		
02:45	3	51	2	85	5	136	555	
03:00	1	50	1	129	2	179		
03:15	0	75	1	113	1	188		
03:30	3	90	2	123	5	213		
03:45	3	83	1	136	4	219	799	
04:00	2	74	2	122	4	196		
04:15	4	66	4	139	8	205		
04:30	7	78	1	121	8	199		
04:45	8	78	2	152	10	230	830	
05:00	11	91	4	139	15	230		
05:15	44	84	6	140	50	224		
05:30	48	97	13	127	61	224		
05:45	84	72	17	141	101	213	891	
06:00	64	74	23	121	87	195		
06:15	68	67	26	83	94	150		
06:30	105	49	51	78	156	127		
06:45	129	43	51	67	180	110	582	
07:00	148	49	42	49	190	98		
07:15	198	32	61	58	259	90		
07:30	220	28	75	51	295	79		
07:45	188	22	100	52	288	74	341	
08:00	195	23	99	37	294	60		
08:15	236	14	86	29	322	43		
08:30	163	24	86	39	249	63		
08:45	182	19	92	33	274	52	218	
09:00	145	18	90	41	235	59		
09:15	134	13	69	34	203	47		
09:30	134	13	49	31	183	44		
09:45	110	15	33	13	143	28	178	
10:00	66	5	46	12	112	17		
10:15	67	12	52	10	119	22		
10:30	55	5	51	16	106	21		
10:45	53	5	44	9	97	14	74	
11:00	39	15	45	12	84	27		
11:15	63	4	60	6	123	10		
11:30	56	9	62	7	118	16		
11:45	63	4	51	5	114	9	62	
Total	3110	2082	1525	3309	4635	5391		
Percent	67.1%	38.6%	32.9%	61.4%				
Day Total		5192		4834		10026		
Peak	07:30	-	04:45	-	07:30	-	04:45	-
Vol.	839	-	350	-	1199	-	908	-
P.H.F.	0.889	-	0.902	-	0.931	-	0.987	-



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Start	NB		SB		Combin		4/6/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Fri	
12:00	3	32	4	59	7	91		
12:15	1	42	5	51	6	93		
12:30	0	44	6	59	6	103		
12:45	0	4	38	156	1	16	48	217
01:00	1	39	1	53	2	86	373	
01:15	1	61	4	67	5	92		
01:30	2	43	3	47	5	128		
01:45	2	6	40	183	3	11	72	239
02:00	2	54	2	80	4	90		
02:15	1	32	1	87	2	112	422	
02:30	1	48	0	126	1	134		
02:45	1	5	57	191	4	7	107	400
03:00	1	87	3	123	4	164	591	
03:15	0	82	0	99	0	210		
03:30	3	83	0	105	3	181		
03:45	4	8	52	304	1	4	115	442
04:00	2	53	2	154	4	188		
04:15	6	69	1	158	7	167	746	
04:30	2	62	1	127	3	207		
04:45	10	20	61	245	3	7	121	560
05:00	14	77	6	120	20	182	805	
05:15	29	76	10	162	39	197		
05:30	43	57	16	167	59	238		
05:45	78	164	53	263	91	209	224	883
06:00	62	57	26	122	88	179		
06:15	71	41	26	96	97	137		
06:30	89	50	45	65	134	115		
06:45	91	313	55	203	137	107	538	
07:00	137	43	40	44	177	87		
07:15	146	30	47	51	193	81		
07:30	156	19	92	24	248	43		
07:45	138	577	11	103	93	272	37	156
08:00	155	19	92	29	247	48		
08:15	147	16	80	20	227	36		
08:30	149	20	80	22	229	42		
08:45	139	590	18	73	65	317	19	90
09:00	122	14	61	27	183	907	37	163
09:15	101	10	62	18	163	41		
09:30	73	17	55	24	128	28		
09:45	79	375	15	56	43	221	15	84
10:00	60	9	43	24	103	33		
10:15	50	11	39	29	89	40		
10:30	67	11	45	19	112	30		
10:45	50	227	9	40	47	174	19	91
11:00	41	11	38	20	79	401	28	131
11:15	41	8	51	6	92	31		
11:30	51	9	53	14	104	23		
11:45	47	180	7	35	51	193	9	49
Total	2469	1852	1410	3283	3879	5135		
Percent	63.7%	36.1%	36.3%	63.9%				
Day Total		4321		4693		9014		
Peak	07:30	-	02:45	-	07:30	-	05:15	-
Vol.	596	-	309	-	357	-	622	-
P.H.F.	0.955	-	0.888	-	0.960	-	0.909	-



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Start	NB		SB		Combin		ed		4/7/2018
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Sat
12:00	4	49	8	48	12	97			
12:15	3	58	9	40	12	98			
12:30	3	58	4	60	7	118			
12:45	1	54	2	69	3	123	34	436	
01:00	3	42	3	51	6	93			
01:15	2	43	4	63	6	106			
01:30	1	59	1	49	2	108			
01:45	0	41	2	69	2	110	16	417	
02:00	3	49	6	50	9	99			
02:15	1	40	2	46	3	86			
02:30	1	51	5	67	6	118			
02:45	0	52	1	86	1	138	19	441	
03:00	0	44	1	63	1	107			
03:15	2	42	0	63	2	105			
03:30	1	36	0	55	1	91			
03:45	0	47	1	66	1	113	5	416	
04:00	0	44	2	58	2	102			
04:15	3	54	2	54	5	108			
04:30	1	36	0	65	1	101			
04:45	2	35	1	54	3	89	11	400	
05:00	5	33	3	41	8	74			
05:15	4	42	2	49	6	91			
05:30	7	41	2	30	9	71			
05:45	6	34	3	38	9	72	32	308	
06:00	8	36	16	38	24	74			
06:15	5	43	16	41	21	84			
06:30	16	28	19	38	35	66			
06:45	16	22	23	46	39	68	119	292	
07:00	22	26	9	41	31	67			
07:15	14	22	15	41	29	63			
07:30	32	19	15	26	47	45			
07:45	33	15	27	28	60	43	167	218	
08:00	20	14	22	24	42	38			
08:15	28	11	25	25	53	36			
08:30	37	18	33	20	70	38			
08:45	53	19	33	24	86	43	251	155	
09:00	35	12	23	18	58	30			
09:15	47	15	28	16	75	31			
09:30	41	8	29	16	70	24			
09:45	41	10	37	24	78	34	281	119	
10:00	40	8	27	26	67	34			
10:15	52	16	40	30	92	46			
10:30	42	9	52	18	94	27			
10:45	46	10	59	19	105	29	358	136	
11:00	50	12	35	10	85	22			
11:15	60	11	54	13	114	24			
11:30	52	7	55	7	107	14			
11:45	46	7	62	7	108	14	414	74	
Total	889	1482	818	1930	1707	3412			
Percent	52.1%	43.4%	47.9%	56.6%					
Day Total		2371		2748		5119			
Peak	10:45	-	12:00	-	11:00	-	02:30	-	-
Vol.	208	-	219	-	206	-	279	-	414
P.H.F.	0.867	-	0.944	-	0.831	-	0.811	-	0.908



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Start	NB		SB		Combin		4/8/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Sun	
12:00	2	39	9	47	11	86		
12:15	2	54	3	58	5	112		
12:30	5	51	7	81	12	132		
12:45	6	58	6	61	12	119	449	
01:00	2	47	5	68	7	115		
01:15	2	46	10	68	12	114		
01:30	1	62	1	57	2	119		
01:45	2	55	4	46	6	101	449	
02:00	2	48	1	50	3	98		
02:15	0	40	1	45	1	85		
02:30	1	35	4	50	5	85		
02:45	7	41	4	52	11	93	361	
03:00	1	31	1	56	2	87		
03:15	0	43	0	52	0	95		
03:30	0	37	1	56	1	93		
03:45	1	36	1	45	2	81	356	
04:00	1	31	2	47	3	78		
04:15	0	41	2	45	2	86		
04:30	1	33	0	33	1	66		
04:45	1	35	2	31	3	66	296	
05:00	1	29	0	47	1	76		
05:15	1	39	3	33	4	72		
05:30	4	34	3	27	7	61		
05:45	1	31	5	39	6	70	279	
06:00	3	24	6	32	9	56		
06:15	7	44	11	39	18	83		
06:30	7	26	10	29	17	55		
06:45	7	31	22	33	29	64	258	
07:00	18	27	8	33	26	60		
07:15	16	18	16	29	32	47		
07:30	21	30	11	25	32	55		
07:45	8	16	17	19	25	35	197	
08:00	14	18	17	25	31	43		
08:15	18	17	19	21	37	38		
08:30	41	15	26	18	67	33		
08:45	47	18	15	23	62	41	155	
09:00	29	10	25	12	54	22		
09:15	35	14	25	10	60	24		
09:30	38	8	21	13	59	21		
09:45	38	5	25	13	63	18	85	
10:00	45	4	26	15	71	19		
10:15	41	8	21	11	62	19		
10:30	40	7	49	10	89	17		
10:45	55	7	63	8	118	15	70	
11:00	43	5	39	8	82	13		
11:15	37	9	47	1	84	10		
11:30	31	3	37	3	68	6		
11:45	40	0	38	3	78	3	32	
Total	723	1360	669	1627	1392	2987		
Percent	51.9%	45.5%	48.1%	54.5%				
Day Total		2083		2296		4379		
Peak	10:00	- 00:45	- 10:30	- 00:30	- 10:30	- 00:30	- -	-
Vol.	181	- 213	- 198	- 278	- 373	- 480	- -	-
P.H.F.	0.823	0.859	0.786	0.858	0.790	0.909		



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Start	NB				SB				Combin ed		4/9/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Mon	
12:00	5		47		6		53		11	100		
12:15	3		43		3		53		6	96		
12:30	1		49		3		47		4	96		
12:45	1	10	44	183	1	13	55	208	2	99	391	
01:00	0		49		2		55		2	104		
01:15	1		35		1		59		2	94		
01:30	1		32		2		57		3	89		
01:45	2	4	41	157	1	6	64	235	3	105	392	
02:00	0		34		1		72		1	106		
02:15	0		44		0		61		0	105		
02:30	0		42		2		100		2	142		
02:45	2	2	45	165	0	3	86	319	2	131	484	
03:00	0		61		2		118		2	179		
03:15	1		61		1		92		2	153		
03:30	1		53		1		108		2	161		
03:45	1	3	78	253	0	4	96	414	1	174	667	
04:00	2		61		0		124		2	185		
04:15	4		62		1		128		5	190		
04:30	7		77		2		108		9	185		
04:45	7	20	73	273	3	6	131	491	10	204	764	
05:00	16		77		6		138		22	215		
05:15	43		79		8		124		51	203		
05:30	58		98		18		110		76	208		
05:45	69	186	58	312	11	43	109	481	80	167	793	
06:00	75		53		22		103		97	156		
06:15	62		42		29		81		91	123		
06:30	90		50		43		92		133	142		
06:45	140	367	37	182	55	149	74	350	195	111	532	
07:00	207		29		43		69		250	98		
07:15	191		38		50		48		241	86		
07:30	176		33		87		42		263	75		
07:45	167	741	17	117	112	292	30	189	279	47	306	
08:00	218		17		87		41		305	58		
08:15	210		15		69		28		279	43		
08:30	207		14		90		24		297	38		
08:45	162	797	19	65	100	346	25	118	262	44	183	
09:00	116		21		87		28		203	49		
09:15	116		15		63		22		179	37		
09:30	93		9		75		17		168	26		
09:45	63	388	8	53	66	291	14	81	129	22	134	
10:00	63		7		42		18		105	25		
10:15	57		2		42		9		99	11		
10:30	47		8		50		14		97	22		
10:45	32	199	4	21	45	179	5	46	77	9	67	
11:00	47		11		37		11		84	22		
11:15	39		4		43		8		82	12		
11:30	47		6		59		8		106	14		
11:45	42	175	4	25	49	188	5	32	91	9	57	
Total	2892		1806		1520		2964		4412	4770		
Percent	65.5%		37.9%		34.5%		62.1%					
Day Total		4698				4484				9182		
Peak	07:45	-	04:45	-	07:45	-	04:15	-	07:45	-	04:45	-
Vol.	802	-	327	-	358	-	505	-	1160	-	830	-
P.H.F.	0.920		0.834		0.799		0.915		0.951		0.965	



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Start	NB				SB				Combin ed		4/10/201 8 Tue	
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.	
12:00	1		51		2		62		3		113	
12:15	3		48		4		66		7		114	
12:30	1		53		0		40		1		93	
12:45	1	6	49	201	3	9	56	224	4	15	105	425
01:00	1		38		0		62		1		100	
01:15	0		49		0		44		0		93	
01:30	3		29		0		50		3		79	
01:45	1	5	50	166	1	1	55	211	2	6	105	377
02:00	1		37		4		79		5		116	
02:15	2		38		0		79		2		117	
02:30	2		48		2		116		4		164	
02:45	0	5	47	170	0	6	82	356	0	11	129	526
03:00	0		53		2		103		2		156	
03:15	1		75		0		121		1		196	
03:30	0		69		0		136		0		205	
03:45	2	3	77	274	1	3	140	500	3	6	217	774
04:00	2		86		3		133		5		219	
04:15	5		78		1		137		6		215	
04:30	8		72		3		130		11		202	
04:45	12	27	79	315	3	10	151	551	15	37	230	866
05:00	13		70		3		140		16		210	
05:15	38		81		10		116		48		197	
05:30	73		73		16		136		89		209	
05:45	79	203	85	309	16	45	129	521	95	248	214	830
06:00	63		62		25		126		88		188	
06:15	71		44		31		100		102		144	
06:30	121		64		42		67		163		131	
06:45	176	431	47	217	55	153	55	348	231	584	102	565
07:00	207		37		63		63		270		100	
07:15	226		26		60		50		286		76	
07:30	212		16		77		42		289		58	
07:45	181	826	18	97	88	288	30	185	269	1114	48	282
08:00	182		22		100		33		282		55	
08:15	186		20		62		28		248		48	
08:30	159		16		92		31		251		47	
08:45	145	672	13	71	85	339	27	119	230	1011	40	190
09:00	152		12		77		27		229		39	
09:15	129		10		60		34		189		44	
09:30	93		16		74		24		167		40	
09:45	77	451	15	53	68	279	28	113	145	730	43	166
10:00	63		13		52		13		115		26	
10:15	57		10		39		10		96		20	
10:30	61		7		45		8		106		15	
10:45	47	228	2	32	58	194	8	39	105	422	10	71
11:00	46		9		55		11		101		20	
11:15	43		4		38		8		81		12	
11:30	45		3		45		7		90		10	
11:45	41	175	2	18	41	179	5	31	82	354	7	49
Total	3032		1923		1506		3198		4538		5121	
Percent	66.8%		37.6%		33.2%		62.4%					
Day Total		4955				4704				9659		
Peak	07:00	-	04:00	-	07:45	-	04:15	-	07:15	-	04:00	-
Vol.	826	-	315	-	342	-	558	-	1126	-	866	-
P.H.F.	0.914		0.916		0.855		0.924		0.974		0.941	



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

11 Cambridge Turnpike Cutoff
south of Lexington Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 C Volume
Site Code: TBA

Start	NB		SB		Combin		ed		4/11/201	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	8	Wed
12:00	1	42	3	63	4	105				
12:15	2	56	3	60	5	116				
12:30	0	50	3	53	3	103				
12:45	2	65	3	70	5	135	17	459		
01:00	1	45	1	54	2	99				
01:15	0	43	3	71	3	114				
01:30	0	48	0	67	0	115				
01:45	0	59	2	58	2	117	7	445		
02:00	1	35	2	91	3	126				
02:15	3	42	0	94	3	136				
02:30	4	49	0	90	4	139				
02:45	2	50	1	85	3	135	13	536		
03:00	0	64	1	113	1	177				
03:15	0	75	0	97	0	172				
03:30	3	77	1	127	4	204				
03:45	4	73	2	120	6	193	11	746		
04:00	1	55	3	106	4	161				
04:15	4	64	3	173	7	237				
04:30	8	66	1	142	9	208				
04:45	13	74	0	137	13	211	33	817		
05:00	16	81	8	140	24	221				
05:15	33	81	6	150	39	231				
05:30	58	89	22	151	80	240				
05:45	78	95	18	139	96	234	239	926		
06:00	73	64	17	122	90	186				
06:15	65	60	28	78	93	138				
06:30	96	65	44	97	140	162				
06:45	144	41	64	81	208	122	531	608		
07:00	227	34	59	75	286	109				
07:15	224	41	79	62	303	103				
07:30	188	28	62	57	250	85				
07:45	198	27	83	52	281	79	1120	376		
08:00	183	31	95	40	278	71				
08:15	193	25	90	50	283	75				
08:30	152	22	93	31	245	53				
08:45	177	13	71	22	248	35	1054	234		
09:00	137	15	84	37	221	52				
09:15	109	15	64	25	173	40				
09:30	84	16	93	23	177	39				
09:45	73	9	57	25	130	34	701	165		
10:00	56	18	45	17	101	35				
10:15	64	5	49	14	113	19				
10:30	60	11	47	12	107	23				
10:45	57	9	54	18	111	27	432	104		
11:00	48	5	55	13	103	18				
11:15	48	4	51	9	99	13				
11:30	41	4	61	6	102	10				
11:45	47	3	53	6	100	9	404	50		
Total	2978	2043	1584	3423	4562	5466				
Percent	65.3%	37.4%	34.7%	62.6%						
Day Total		5021		5007		10028				
Peak	07:00	-	05:00	-	07:45	-	04:15	-	07:00	-
Vol.	837	-	346	-	361	-	592	-	1120	-
P.H.F.	0.922	-	0.911	-	0.950	-	0.855	-	0.924	-



PRECISION
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INDUSTRIES, LLC

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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	9	0	0	0	0	0	0	0	0	0	0	0	9
01:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
05:00	0	7	1	0	0	0	0	0	0	0	0	0	0	8
06:00	0	23	6	1	3	1	0	0	0	0	0	0	0	34
07:00	0	93	17	1	1	0	0	0	0	0	0	0	0	112
08:00	0	176	20	1	0	0	0	0	0	0	0	0	0	197
09:00	0	115	15	0	3	1	0	0	1	0	0	0	0	135
10:00	0	62	12	1	1	0	0	0	0	0	0	0	0	76
11:00	1	106	17	2	1	1	0	0	0	0	0	0	0	128
12 PM	1	124	19	4	1	1	0	1	0	0	0	0	0	151
13:00	0	100	18	0	4	0	0	0	1	0	0	0	0	123
14:00	0	150	24	1	2	0	0	1	0	0	0	0	0	178
15:00	0	339	83	2	10	0	0	1	0	0	0	0	0	435
16:00	1	615	76	0	12	1	0	1	0	0	0	0	0	706
17:00	9	534	54	0	8	1	0	0	0	0	0	0	0	606
18:00	0	272	20	1	4	0	0	0	0	0	0	0	0	297
19:00	0	144	8	0	0	0	0	0	0	0	0	0	0	152
20:00	0	66	4	0	0	0	0	0	0	0	0	0	0	70
21:00	0	57	7	0	1	0	0	0	0	0	0	0	0	65
22:00	0	31	1	0	0	0	0	0	0	0	0	0	0	32
23:00	0	13	3	0	0	0	0	0	0	0	0	0	0	16
Total	12	3044	408	14	51	6	0	4	2	0	0	0	0	3541
Percent	0.3%	86.0%	11.5%	0.4%	1.4%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	08:00	08:00	11:00	06:00	06:00			09:00					08:00
Vol.	1	176	20	2	3	1			1					197
PM Peak	17:00	16:00	15:00	12:00	16:00	12:00		12:00	13:00					16:00
Vol.	9	615	83	4	12	1		1	1					706



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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	13	0	0	0	0	0	0	0	0	0	0	0	13
01:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
05:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
06:00	0	29	5	0	1	1	0	0	0	0	0	0	0	36
07:00	0	94	17	2	4	0	0	0	0	0	0	0	0	117
08:00	1	135	24	1	4	0	0	0	0	0	0	0	0	165
09:00	0	103	22	0	4	1	0	1	0	0	0	0	0	131
10:00	1	71	18	1	4	0	0	0	1	0	0	0	0	96
11:00	1	92	17	0	5	0	2	0	0	0	0	0	0	117
12 PM	1	112	20	0	4	0	0	0	0	0	0	0	0	137
13:00	1	117	20	2	3	1	0	0	0	0	0	0	0	144
14:00	0	186	42	2	3	0	0	0	0	0	0	0	0	233
15:00	0	495	79	1	11	2	0	0	1	0	0	0	0	589
16:00	2	411	60	0	8	1	0	0	0	0	0	0	0	482
17:00	1	452	31	0	5	0	0	0	0	0	0	0	0	489
18:00	1	177	18	0	2	0	0	0	0	0	0	0	0	198
19:00	0	83	6	0	0	0	0	0	0	0	0	0	0	89
20:00	0	56	2	0	0	0	0	0	0	0	0	0	0	58
21:00	0	41	1	0	0	0	0	0	0	0	0	0	0	42
22:00	0	46	3	0	0	0	0	0	0	0	0	0	0	49
23:00	0	24	4	0	0	0	0	0	0	0	0	0	0	28
Total	9	2752	390	9	58	6	2	1	2	0	0	0	0	3229
Percent	0.3%	85.2%	12.1%	0.3%	1.8%	0.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	07:00	11:00	06:00	11:00	09:00	10:00					08:00
Vol.	1	135	24	2	5	1	2	1	1					165
PM Peak	16:00	15:00	15:00	13:00	15:00	15:00			15:00					15:00
Vol.	2	495	79	2	11	2			1					589



PRECISION
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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/07/1														
8	0	14	0	0	0	0	0	0	0	0	0	0	0	14
01:00	0	4	0	0	1	0	0	0	0	0	0	0	0	5
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
05:00	0	2	2	0	0	0	0	0	0	0	0	0	0	4
06:00	0	7	2	0	0	0	0	0	0	0	0	0	0	9
07:00	0	29	6	0	0	0	0	0	0	0	0	0	0	35
08:00	0	51	9	0	2	0	0	0	0	0	0	0	0	62
09:00	2	82	9	0	2	0	0	0	0	0	0	0	0	95
10:00	0	95	13	0	4	0	0	0	0	1	0	0	0	113
11:00	7	118	14	0	2	0	0	0	0	0	0	0	0	141
12 PM	2	96	13	0	2	0	0	0	0	0	0	0	0	113
13:00	12	104	14	0	4	0	0	0	0	0	0	0	0	134
14:00	5	157	17	0	1	0	0	1	0	0	0	0	0	181
15:00	9	159	12	0	1	0	0	0	0	0	0	0	0	181
16:00	5	112	12	0	0	0	0	0	0	0	0	0	0	129
17:00	2	114	12	0	3	0	0	0	0	0	0	0	0	131
18:00	3	71	5	0	0	0	0	0	0	0	0	0	0	79
19:00	0	54	5	0	1	0	0	0	0	0	0	0	0	60
20:00	0	38	2	0	0	0	0	0	0	0	0	0	0	40
21:00	0	42	2	0	0	0	0	0	0	0	0	0	0	44
22:00	1	33	2	0	0	0	0	0	0	0	0	0	0	36
23:00	0	32	4	0	1	0	0	0	0	0	0	0	0	37
Total	48	1420	155	0	24	0	0	1	0	1	0	0	0	1649
Percent	2.9%	86.1%	9.4%	0.0%	1.5%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	
AM Peak	11:00	11:00	11:00		10:00					10:00				11:00
Vol.	7	118	14		4					1				141
PM Peak	13:00	15:00	14:00		13:00			14:00						14:00
Vol.	12	159	17		4			1						181



PRECISION
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NB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/08/1														
8	0	13	0	0	0	0	0	0	0	0	0	0	0	13
01:00	0	2	2	0	0	0	0	0	0	0	0	0	0	4
02:00	0	4	1	0	0	0	0	0	0	0	0	0	0	5
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
06:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
07:00	0	16	5	0	1	0	0	0	0	0	0	0	0	22
08:00	0	53	2	0	0	0	0	0	0	0	0	0	0	55
09:00	1	67	9	0	1	0	0	0	0	0	0	0	0	78
10:00	1	103	10	0	0	1	0	0	0	0	0	0	0	115
11:00	2	116	7	0	0	0	0	0	0	0	0	0	0	125
12 PM	6	124	12	0	2	0	0	0	0	0	0	0	0	144
13:00	7	111	11	0	0	0	0	0	0	0	0	0	0	129
14:00	7	119	9	0	0	0	0	0	0	0	0	0	0	135
15:00	2	95	9	0	1	0	0	0	0	0	0	0	0	107
16:00	0	111	6	0	0	0	0	0	0	0	0	0	0	117
17:00	1	103	8	0	0	0	0	0	0	0	0	0	0	112
18:00	1	84	3	0	0	0	0	0	0	0	0	0	0	88
19:00	0	58	10	0	0	0	0	0	0	0	0	0	0	68
20:00	1	44	2	0	0	1	0	0	0	0	0	0	0	48
21:00	1	24	3	0	0	0	0	0	0	0	0	0	0	28
22:00	0	19	1	0	0	0	0	0	0	0	0	0	0	20
23:00	0	11	1	0	0	0	0	0	0	0	0	0	0	12
Total	30	1285	111	0	5	2	0	0	0	0	0	0	0	1433
Percent	2.1%	89.7%	7.7%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	11:00	10:00		07:00	10:00								11:00
Vol.	2	116	10		1	1								125
PM Peak	13:00	12:00	12:00		12:00	20:00								12:00
Vol.	7	124	12		2	1								144



PRECISION
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176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
05:00	0	5	0	0	0	1	0	0	0	0	0	0	0	6
06:00	0	33	9	0	1	0	0	0	0	0	0	0	0	43
07:00	0	105	17	1	1	0	0	0	0	0	0	0	0	124
08:00	0	175	30	1	5	1	0	0	0	0	0	0	0	212
09:00	0	99	18	2	4	0	0	0	0	0	0	0	0	123
10:00	0	75	11	0	7	0	0	1	0	0	0	0	0	94
11:00	0	91	19	1	2	0	0	0	0	0	0	0	0	113
12 PM	0	91	18	0	2	0	0	0	0	0	0	0	0	111
13:00	0	108	22	2	6	1	0	0	0	0	0	0	0	139
14:00	1	151	23	1	4	2	0	0	0	0	0	0	0	182
15:00	7	343	66	1	8	0	0	0	0	0	0	0	0	425
16:00	0	480	57	1	9	0	0	0	0	0	0	0	0	547
17:00	7	553	55	1	6	2	0	1	0	0	0	0	0	625
18:00	0	234	25	0	3	1	0	0	0	0	0	0	0	263
19:00	0	115	5	1	1	0	0	0	0	0	0	0	0	122
20:00	0	55	1	0	0	0	0	0	0	0	0	0	0	56
21:00	0	41	2	0	0	0	0	0	0	0	0	0	0	43
22:00	0	29	3	0	0	0	0	0	0	0	0	0	0	32
23:00	0	13	1	0	1	0	0	0	0	0	0	0	0	15
Total	15	2807	382	12	60	8	0	2	0	0	0	0	0	3286
Percent	0.5%	85.4%	11.6%	0.4%	1.8%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		08:00	08:00	09:00	10:00	05:00		10:00						08:00
Vol.		175	30	2	7	1		1						212
PM Peak	15:00	17:00	15:00	13:00	16:00	14:00		17:00						17:00
Vol.	7	553	66	2	9	2		1						625



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	10	0	0	0	0	0	0	0	0	0	0	0	10
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	5	1	0	0	0	0	0	0	0	0	0	0	6
05:00	0	7	2	0	0	0	0	0	0	0	0	0	0	9
06:00	0	31	5	0	1	0	0	0	0	0	0	0	0	37
07:00	0	108	18	1	2	0	0	0	0	0	0	0	0	129
08:00	2	161	22	0	4	1	0	0	0	0	0	0	0	190
09:00	1	98	21	1	4	1	0	2	1	0	0	0	0	129
10:00	0	84	14	1	2	1	0	0	0	0	0	0	0	102
11:00	0	85	21	1	1	0	0	0	0	0	0	0	0	108
12 PM	0	138	20	2	4	1	0	0	0	0	0	0	0	165
13:00	0	103	20	1	5	0	0	0	0	0	0	0	0	129
14:00	0	129	22	1	4	0	0	2	0	0	0	0	0	158
15:00	0	349	71	2	14	1	0	2	0	0	0	0	0	439
16:00	0	598	64	0	2	3	0	1	0	0	0	0	0	668
17:00	5	569	58	0	9	0	0	1	0	0	0	0	0	642
18:00	0	243	18	4	5	0	0	0	0	0	0	0	0	270
19:00	0	93	2	0	2	0	0	0	0	0	0	0	0	97
20:00	0	72	4	0	0	0	0	0	0	0	0	0	0	76
21:00	0	33	3	0	1	0	0	0	0	0	0	0	0	37
22:00	0	36	2	0	0	0	0	0	0	0	0	0	0	38
23:00	0	18	2	0	1	0	0	0	0	0	0	0	0	21
Total	8	2975	390	14	61	8	0	8	1	0	0	0	0	3465
Percent	0.2%	85.9%	11.3%	0.4%	1.8%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	07:00	08:00	08:00		09:00	09:00					08:00
Vol.	2	161	22	1	4	1		2	1					190
PM Peak	17:00	16:00	15:00	18:00	15:00	16:00		14:00						16:00
Vol.	5	598	71	4	14	3		2						668



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176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	8	0	0	1	0	0	0	0	0	0	0	0	9
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	1	1	0	0	0	1	0	0	0	0	0	0	0	3
04:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
05:00	0	8	1	0	1	0	0	0	0	0	0	0	0	10
06:00	0	44	8	0	2	1	0	0	0	0	0	0	0	55
07:00	1	111	19	1	1	0	0	0	0	0	0	0	0	133
08:00	2	159	26	0	5	0	0	0	1	0	0	0	0	193
09:00	0	115	20	0	3	1	0	0	0	0	0	0	0	139
10:00	3	70	11	1	6	0	0	0	0	0	0	0	0	91
11:00	0	88	18	2	5	1	1	0	0	0	0	0	0	115
12 PM	19	132	18	0	2	1	0	0	0	0	0	0	0	172
13:00	7	123	28	3	15	2	1	0	0	0	0	0	0	179
14:00	6	152	20	1	7	2	1	1	0	0	0	0	0	190
15:00	2	368	75	2	10	3	0	1	0	0	0	0	0	461
16:00	2	495	75	0	6	1	0	1	0	0	0	0	0	580
17:00	3	499	44	0	6	2	0	0	0	0	0	0	0	554
18:00	1	235	32	0	3	0	0	0	0	0	0	0	0	271
19:00	2	118	7	0	0	0	0	0	0	0	0	0	0	127
20:00	0	70	4	0	0	0	0	0	0	0	0	0	0	74
21:00	0	54	3	0	0	0	0	0	0	0	0	0	0	57
22:00	0	39	1	0	0	0	0	0	0	0	0	0	0	40
23:00	0	18	1	0	1	0	0	0	0	0	0	0	0	20
Total	49	2914	411	10	74	15	3	3	1	0	0	0	0	3480
Percent	1.4%	83.7%	11.8%	0.3%	2.1%	0.4%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	08:00	08:00	11:00	10:00	03:00	11:00		08:00					08:00
Vol.	3	159	26	2	6	1	1		1					193
PM Peak	12:00	17:00	15:00	13:00	13:00	15:00	13:00	14:00						16:00
Vol.	19	499	75	3	15	3	1	1						580



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SB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
05:00	0	29	8	1	2	0	0	0	0	0	0	0	0	40
06:00	0	175	36	1	5	0	0	0	0	0	0	0	0	217
07:00	0	316	53	3	11	0	0	0	0	0	0	0	0	383
08:00	2	353	74	2	8	0	0	0	0	0	0	0	0	439
09:00	1	177	29	1	5	1	0	2	0	0	0	0	0	216
10:00	0	82	29	0	2	0	0	0	0	0	0	0	0	113
11:00	1	74	16	1	3	0	0	0	0	0	0	0	0	95
12 PM	1	84	22	4	3	1	0	1	0	0	0	0	0	116
13:00	0	70	19	0	3	0	0	1	0	0	0	0	0	93
14:00	0	97	21	2	2	0	0	0	0	1	0	0	0	123
15:00	2	109	29	4	2	0	0	0	0	0	0	0	0	146
16:00	0	84	18	2	4	0	0	0	0	0	0	0	0	108
17:00	0	150	18	1	1	0	0	0	0	0	0	0	0	170
18:00	0	79	16	1	0	0	0	0	0	0	0	0	0	96
19:00	0	59	5	0	0	0	0	0	0	0	0	0	0	64
20:00	0	29	7	0	1	0	0	0	0	0	0	0	0	37
21:00	0	25	5	0	0	0	0	0	0	0	0	0	0	30
22:00	1	15	5	0	0	1	0	0	0	0	0	0	0	22
23:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
Total	8	2028	411	23	52	3	0	4	0	1	0	0	0	2530
Percent	0.3%	80.2%	16.2%	0.9%	2.1%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	07:00	07:00	09:00		09:00						08:00
Vol.	2	353	74	3	11	1		2						439
PM Peak	15:00	17:00	15:00	12:00	16:00	12:00		12:00		14:00				17:00
Vol.	2	150	29	4	4	1		1		1				170



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SB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	4	0	0	0	0	0	0	0	0	0	0	0	4
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
05:00	0	25	5	0	3	0	0	0	0	0	0	0	0	33
06:00	0	153	28	1	2	0	0	0	0	0	0	0	0	184
07:00	0	283	43	4	9	0	0	0	0	0	0	0	0	339
08:00	0	276	55	4	10	0	0	0	0	0	0	0	0	345
09:00	1	126	35	1	4	0	0	1	0	0	0	0	0	168
10:00	1	89	16	1	4	0	0	0	0	0	0	0	0	111
11:00	0	94	8	0	4	0	0	0	0	0	0	0	0	106
12 PM	2	82	15	0	2	1	0	0	0	0	0	0	0	102
13:00	2	82	15	0	2	1	0	2	0	0	0	0	0	104
14:00	0	110	24	2	4	1	0	1	0	0	0	0	0	142
15:00	2	108	18	3	4	0	0	0	0	0	0	0	0	135
16:00	0	149	25	0	5	0	0	0	0	0	0	0	0	179
17:00	0	122	21	1	2	0	0	0	0	0	0	0	0	146
18:00	0	69	10	0	2	0	0	0	0	0	0	0	0	81
19:00	0	40	10	0	0	0	0	0	0	0	0	0	0	50
20:00	0	28	3	0	0	0	0	0	0	0	0	0	0	31
21:00	0	26	4	0	0	0	0	0	0	0	0	0	0	30
22:00	0	15	3	0	0	0	0	0	0	0	0	0	0	18
23:00	0	19	0	0	0	0	0	0	0	0	0	0	0	19
Total	8	1908	339	17	57	3	0	4	0	0	0	0	0	2336
Percent	0.3%	81.7%	14.5%	0.7%	2.4%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	07:00	08:00	07:00	08:00			09:00						08:00
Vol.	1	283	55	4	10			1						345
PM Peak	12:00	16:00	16:00	15:00	16:00	12:00		13:00						16:00
Vol.	2	149	25	3	5	1		2						179



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176038 D Class
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Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/07/1														
8	0	6	0	0	0	0	0	0	0	0	0	0	0	6
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
05:00	0	2	0	0	1	0	0	0	0	0	0	0	0	3
06:00	0	11	6	0	1	0	0	0	0	0	0	0	0	18
07:00	0	44	8	0	1	0	0	1	0	0	0	0	0	54
08:00	0	67	15	1	4	0	0	0	0	0	0	0	0	87
09:00	0	82	10	0	2	0	0	0	0	0	0	0	0	94
10:00	0	92	18	0	1	0	0	0	0	0	0	0	0	111
11:00	0	97	16	0	4	0	0	0	0	0	0	0	0	117
12 PM	0	172	36	0	4	0	0	0	0	0	0	0	0	212
13:00	0	109	20	0	4	0	0	1	0	0	0	0	0	134
14:00	0	111	18	0	0	0	0	0	0	0	0	0	0	129
15:00	0	86	18	0	2	0	0	0	0	0	0	0	0	106
16:00	0	81	7	0	1	0	0	0	0	0	0	0	0	89
17:00	0	91	9	0	0	0	0	0	0	0	0	0	0	100
18:00	2	79	9	0	1	0	0	0	0	0	0	0	0	91
19:00	0	51	10	0	0	0	0	0	0	0	0	0	0	61
20:00	0	21	4	0	0	0	0	0	0	0	0	0	0	25
21:00	0	20	8	0	0	0	0	0	0	0	0	0	0	28
22:00	0	28	3	0	0	0	0	0	0	0	0	0	0	31
23:00	0	10	7	0	0	0	0	0	0	0	0	0	0	17
Total	2	1261	223	1	26	0	0	2	0	0	0	0	0	1515
Percent	0.1%	83.2%	14.7%	0.1%	1.7%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM														
Peak		11:00	10:00	08:00	08:00			07:00						11:00
Vol.		97	18	1	4			1						117
PM														
Peak	18:00	12:00	12:00		12:00			13:00						12:00
Vol.	2	172	36		4			1						212



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04/09/1														
8	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	3	1	0	0	2	0	0	0	0	0	0	0	6
04:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
05:00	0	38	11	0	0	0	0	0	0	0	0	0	0	49
06:00	0	166	28	1	2	0	0	0	0	0	0	0	0	197
07:00	1	330	56	3	8	2	0	2	0	0	0	0	0	402
08:00	1	360	65	2	11	0	0	2	0	0	0	0	0	441
09:00	1	203	51	1	5	0	0	1	0	0	0	0	0	262
10:00	0	87	15	1	5	0	0	1	1	0	0	0	0	110
11:00	1	71	21	0	2	1	0	0	0	0	0	0	0	96
12 PM	0	80	20	0	4	0	0	0	0	0	0	0	0	104
13:00	0	84	24	1	4	0	0	0	0	0	0	0	0	113
14:00	0	80	22	4	2	0	0	0	0	0	0	0	0	108
15:00	0	99	23	2	4	0	0	0	0	0	0	0	0	128
16:00	0	98	15	0	2	0	0	0	0	0	0	0	0	115
17:00	3	109	6	1	2	1	0	0	0	0	0	0	0	122
18:00	0	89	16	0	0	0	0	0	0	0	0	0	0	105
19:00	0	43	10	0	2	0	0	0	0	0	0	0	0	55
20:00	0	31	3	0	0	1	0	0	0	0	0	0	0	35
21:00	0	18	5	0	1	0	0	0	0	0	0	0	0	24
22:00	0	10	2	0	0	0	0	0	0	0	0	0	0	12
23:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
Total	7	2011	396	16	54	7	0	6	1	0	0	0	0	2498
Percent	0.3%	80.5%	15.9%	0.6%	2.2%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	08:00	07:00	08:00	03:00		07:00	10:00					08:00
Vol.	1	360	65	3	11	2		2	1					441
PM Peak	17:00	17:00	13:00	14:00	12:00	17:00								15:00
Vol.	3	109	24	4	4	1								128



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04/10/1														
8	0	2	1	0	0	0	0	0	0	0	0	0	0	3
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
04:00	0	5	1	0	0	1	0	0	0	0	0	0	0	7
05:00	0	36	5	0	2	0	0	0	0	0	0	0	0	43
06:00	0	155	29	1	2	1	0	0	0	0	0	0	0	188
07:00	2	334	59	2	7	0	0	0	0	0	0	0	0	404
08:00	1	351	76	2	14	1	0	1	1	0	0	0	0	447
09:00	0	176	36	0	5	1	0	2	1	0	0	0	0	221
10:00	0	77	19	1	3	0	0	1	0	0	0	0	0	101
11:00	0	79	22	1	5	0	0	0	0	0	0	0	0	107
12 PM	0	84	19	1	4	0	0	0	0	0	0	0	0	108
13:00	1	75	16	2	7	1	0	0	0	0	0	0	0	102
14:00	0	88	28	1	2	0	0	0	0	0	0	0	0	119
15:00	0	103	20	2	3	0	0	0	1	0	0	0	0	129
16:00	1	114	26	0	1	1	0	0	0	0	0	0	0	143
17:00	2	113	10	0	0	0	0	0	1	0	0	0	0	126
18:00	0	75	9	0	1	0	0	0	0	0	0	0	0	85
19:00	0	53	8	0	1	0	0	0	0	0	0	0	0	62
20:00	0	35	5	0	0	0	0	0	0	0	0	0	0	40
21:00	0	19	1	0	0	0	0	0	0	0	0	0	0	20
22:00	0	20	4	0	0	0	0	0	0	0	0	0	0	24
23:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Total	7	2000	394	13	57	6	0	4	4	0	0	0	0	2485
Percent	0.3%	80.5%	15.9%	0.5%	2.3%	0.2%	0.0%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	08:00	07:00	08:00	04:00		09:00	08:00					08:00
Vol.	2	351	76	2	14	1		2	1					447
PM Peak	17:00	16:00	14:00	13:00	13:00	13:00			15:00					16:00
Vol.	2	114	28	2	7	1			1					143



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 D Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	2	1	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1
03:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
04:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
05:00	0	31	6	0	1	0	0	0	0	0	0	0	0	38
06:00	1	168	35	0	5	0	0	0	0	0	0	0	0	209
07:00	0	293	61	5	12	1	0	1	0	0	0	0	0	373
08:00	2	380	64	3	13	2	0	0	0	0	0	0	0	464
09:00	1	208	47	1	7	2	0	1	1	0	0	0	0	268
10:00	0	83	21	1	7	0	0	1	1	0	0	0	0	114
11:00	0	102	23	1	4	1	0	0	0	0	0	0	0	131
12 PM	0	94	30	1	2	3	0	0	0	0	0	0	0	130
13:00	1	85	18	0	2	0	0	0	0	0	0	0	0	106
14:00	3	100	18	3	5	2	0	0	0	0	0	0	0	131
15:00	2	107	31	1	6	3	0	1	0	0	0	0	0	151
16:00	0	130	18	0	1	0	0	0	0	0	0	0	0	149
17:00	1	159	22	0	1	0	0	0	0	0	0	0	0	183
18:00	1	91	13	0	2	0	0	0	0	0	0	0	0	107
19:00	0	51	13	0	1	0	0	0	0	0	0	0	0	65
20:00	0	28	5	0	0	0	0	0	0	0	0	0	0	33
21:00	0	31	1	0	0	0	0	0	0	0	0	0	0	32
22:00	0	16	2	0	0	0	0	0	0	0	0	0	0	18
23:00	0	8	0	0	0	0	0	0	0	0	0	0	0	8
Total	12	2176	431	17	69	14	0	4	2	0	0	0	0	2725
Percent	0.4%	79.9%	15.8%	0.6%	2.5%	0.5%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	07:00	08:00	08:00		07:00	09:00					08:00
Vol.	2	380	64	5	13	2		1	1					464
PM Peak	14:00	17:00	15:00	14:00	15:00	12:00		15:00						17:00
Vol.	3	159	31	3	6	3		1						183



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359 Old Bedford Road
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NB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	0	3	5	1	0	0	0	0	0	0	9	38	36
01:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3	37	35
02:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	0	1	0	2	0	2	0	0	0	0	0	5	47	39
05:00	0	0	0	2	3	2	0	1	0	0	0	0	0	8	38	34
06:00	0	0	0	1	15	16	2	0	0	0	0	0	0	34	38	35
07:00	0	0	1	5	48	46	12	0	0	0	0	0	0	112	38	35
08:00	0	0	2	4	90	85	15	1	0	0	0	0	0	197	38	35
09:00	0	0	0	10	42	76	5	2	0	0	0	0	0	135	38	35
10:00	0	0	0	5	27	34	10	0	0	0	0	0	0	76	38	35
11:00	1	0	0	9	47	50	20	1	0	0	0	0	0	128	39	35
12 PM	0	0	6	9	51	65	19	1	0	0	0	0	0	151	38	35
13:00	0	1	1	6	52	55	7	1	0	0	0	0	0	123	38	34
14:00	0	0	0	11	59	80	27	1	0	0	0	0	0	178	39	36
15:00	0	0	4	29	181	189	32	0	0	0	0	0	0	435	38	34
16:00	122	62	58	63	226	159	15	0	1	0	0	0	0	706	36	27
17:00	18	33	66	119	247	108	14	1	0	0	0	0	0	606	35	30
18:00	0	0	1	22	131	122	20	0	1	0	0	0	0	297	38	34
19:00	0	0	0	18	62	64	8	0	0	0	0	0	0	152	37	34
20:00	0	0	1	10	33	18	6	2	0	0	0	0	0	70	38	34
21:00	0	1	1	10	27	21	5	0	0	0	0	0	0	65	37	33
22:00	0	0	0	4	10	13	3	2	0	0	0	0	0	32	39	35
23:00	0	0	0	1	4	8	2	0	1	0	0	0	0	16	40	37
Total	141	97	141	339	1360	1222	223	15	3	0	0	0	0	3541		
%	4.0%	2.7%	4.0%	9.6%	38.4%	34.5%	6.3%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00		08:00	09:00	08:00	08:00	11:00	04:00						08:00		
Vol.	1		2	10	90	85	20	2						197		
PM Peak	16:00	16:00	17:00	17:00	17:00	15:00	15:00	20:00	16:00					16:00		
Vol.	122	62	66	119	247	189	32	2	1					706		

Stats

15th Percentile : 26 MPH
50th Percentile : 32 MPH
85th Percentile : 37 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 32 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2582
Percent in Pace : 72.9%
Number of Vehicles > 35 MPH : 1219
Percent of Vehicles > 35 MPH : 34.4%



PRECISION
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359 Old Bedford Road
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NB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	0	5	8	0	0	0	0	0	0	0	13	37	35
01:00	0	0	0	1	0	2	1	1	0	0	0	0	0	5	45	38
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	1	0	1	0	0	0	0	0	0	0	2	37	32
04:00	0	0	0	0	2	1	0	1	0	0	0	0	0	4	46	37
05:00	0	0	0	1	2	2	0	0	0	0	0	0	0	5	37	33
06:00	0	0	1	1	12	19	3	0	0	0	0	0	0	36	38	35
07:00	0	0	0	6	46	53	12	0	0	0	0	0	0	117	38	35
08:00	0	0	0	19	62	66	17	1	0	0	0	0	0	165	38	35
09:00	0	1	6	8	62	49	5	0	0	0	0	0	0	131	37	33
10:00	0	1	1	7	45	34	8	0	0	0	0	0	0	96	38	34
11:00	1	0	0	11	48	46	10	1	0	0	0	0	0	117	38	34
12 PM	2	0	5	20	61	45	3	1	0	0	0	0	0	137	37	33
13:00	0	6	3	11	68	45	11	0	0	0	0	0	0	144	37	33
14:00	0	0	2	21	89	97	21	2	1	0	0	0	0	233	38	35
15:00	51	33	60	110	206	114	15	0	0	0	0	0	0	589	35	28
16:00	0	7	21	98	227	118	11	0	0	0	0	0	0	482	36	32
17:00	76	9	33	57	171	132	11	0	0	0	0	0	0	489	36	28
18:00	0	0	0	2	80	92	21	3	0	0	0	0	0	198	38	36
19:00	0	0	3	12	36	30	7	1	0	0	0	0	0	89	38	34
20:00	0	1	3	10	24	14	6	0	0	0	0	0	0	58	38	33
21:00	0	0	1	7	21	12	1	0	0	0	0	0	0	42	36	33
22:00	0	0	0	6	20	22	1	0	0	0	0	0	0	49	37	34
23:00	0	0	0	3	14	4	7	0	0	0	0	0	0	28	40	35
Total	130	58	139	412	1301	1006	171	11	1	0	0	0	0	3229		
%	4.0%	1.8%	4.3%	12.8%	40.3%	31.2%	5.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	09:00	09:00	08:00	08:00	08:00	08:00	01:00						08:00		
Vol.	1	1	6	19	62	66	17	1						165		
PM Peak	17:00	15:00	15:00	15:00	16:00	17:00	14:00	18:00	14:00					15:00		
Vol.	76	33	60	110	227	132	21	3	1					589		

Stats

15th Percentile : 25 MPH
50th Percentile : 32 MPH
85th Percentile : 37 MPH
95th Percentile : 39 MPH

Mean Speed(Average) : 32 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2307
Percent in Pace : 71.4%
Number of Vehicles > 35 MPH : 988
Percent of Vehicles > 35 MPH : 30.6%



PRECISION
D A T A
INDUSTRIES, LLC

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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/																
18	0	0	0	3	5	6	0	0	0	0	0	0	0	14	37	33
01:00	0	0	0	1	1	2	0	1	0	0	0	0	0	5	45	36
02:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3	37	35
05:00	0	0	0	0	2	1	1	0	0	0	0	0	0	4	41	36
06:00	0	0	0	1	2	4	2	0	0	0	0	0	0	9	40	36
07:00	0	1	0	2	11	18	2	1	0	0	0	0	0	35	38	35
08:00	0	0	0	3	24	27	7	1	0	0	0	0	0	62	38	35
09:00	0	2	1	12	37	36	7	0	0	0	0	0	0	95	37	34
10:00	0	1	0	7	60	33	12	0	0	0	0	0	0	113	38	34
11:00	4	2	2	10	61	46	12	3	1	0	0	0	0	141	38	34
12 PM	2	1	1	14	55	33	7	0	0	0	0	0	0	113	37	33
13:00	2	8	9	26	56	27	6	0	0	0	0	0	0	134	36	31
14:00	0	5	5	26	85	47	10	3	0	0	0	0	0	181	37	33
15:00	1	8	1	17	67	69	18	0	0	0	0	0	0	181	38	34
16:00	0	5	0	16	47	49	10	2	0	0	0	0	0	129	38	34
17:00	0	1	1	13	63	49	4	0	0	0	0	0	0	131	37	33
18:00	1	2	3	4	35	24	10	0	0	0	0	0	0	79	38	33
19:00	0	0	1	5	34	17	3	0	0	0	0	0	0	60	37	33
20:00	0	1	2	2	24	9	2	0	0	0	0	0	0	40	36	32
21:00	0	0	1	7	17	13	5	1	0	0	0	0	0	44	38	34
22:00	1	0	0	5	14	16	0	0	0	0	0	0	0	36	37	33
23:00	0	0	0	2	16	15	3	1	0	0	0	0	0	37	38	35
Total	11	37	27	176	718	545	121	13	1	0	0	0	0	1649		
%	0.7%	2.2%	1.6%	10.7%	43.5%	33.1%	7.3%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	09:00	11:00	09:00	11:00	11:00	10:00	11:00	11:00					11:00		
Vol.	4	2	2	12	61	46	12	3	1					141		
PM Peak	12:00	13:00	13:00	13:00	14:00	15:00	15:00	14:00						14:00		
Vol.	2	8	9	26	85	69	18	3						181		

Stats

15th Percentile : 28 MPH
50th Percentile : 32 MPH
85th Percentile : 37 MPH
95th Percentile : 41 MPH

Mean Speed(Average) : 33 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1263
Percent in Pace : 76.6%
Number of Vehicles > 35 MPH : 571
Percent of Vehicles > 35 MPH : 34.6%



PRECISION
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176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	1	2	7	3	0	0	0	0	0	0	13	40	37
01:00	0	0	0	0	3	1	0	0	0	0	0	0	0	4	36	33
02:00	0	0	0	0	1	3	0	1	0	0	0	0	0	5	45	38
03:00	0	0	0	0	0	1	1	0	0	0	0	0	0	2	42	40
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	1	0	1	0	1	0	0	0	0	0	0	0	3	36	27
06:00	0	0	0	0	0	3	0	0	0	0	0	0	0	3	38	37
07:00	0	0	0	2	10	4	6	0	0	0	0	0	0	22	41	35
08:00	0	0	1	2	18	26	5	3	0	0	0	0	0	55	38	36
09:00	0	1	1	1	32	35	7	1	0	0	0	0	0	78	38	35
10:00	0	1	3	11	50	37	13	0	0	0	0	0	0	115	38	34
11:00	0	2	2	15	53	38	14	1	0	0	0	0	0	125	38	34
12 PM	2	1	2	12	55	58	13	1	0	0	0	0	0	144	38	34
13:00	0	9	3	13	41	48	14	1	0	0	0	0	0	129	38	33
14:00	0	6	1	12	60	51	5	0	0	0	0	0	0	135	37	33
15:00	0	2	1	3	40	50	9	1	1	0	0	0	0	107	38	35
16:00	1	0	3	12	43	49	9	0	0	0	0	0	0	117	38	34
17:00	0	1	3	15	49	37	5	1	1	0	0	0	0	112	37	33
18:00	0	1	1	5	28	38	14	1	0	0	0	0	0	88	39	35
19:00	0	0	0	8	29	18	11	1	1	0	0	0	0	68	40	35
20:00	0	0	0	6	14	20	6	2	0	0	0	0	0	48	39	35
21:00	0	0	1	4	15	5	1	1	1	0	0	0	0	28	37	33
22:00	0	0	0	3	4	11	1	1	0	0	0	0	0	20	38	35
23:00	0	0	0	0	6	4	2	0	0	0	0	0	0	12	39	35
Total	3	25	22	126	553	545	139	16	4	0	0	0	0	1433		
%	0.2%	1.7%	1.5%	8.8%	38.6%	38.0%	9.7%	1.1%	0.3%	0.0%	0.0%	0.0%	0.0%			
AM Peak		11:00	10:00	11:00	11:00	11:00	11:00	08:00						11:00		
Vol.		2	3	15	53	38	14	3						125		
PM Peak	12:00	13:00	13:00	17:00	14:00	12:00	13:00	20:00	15:00					12:00		
Vol.	2	9	3	15	60	58	14	2	1					144		

Stats

15th Percentile : 29 MPH
50th Percentile : 33 MPH
85th Percentile : 38 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 34 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1098
Percent in Pace : 76.6%
Number of Vehicles > 35 MPH : 595
Percent of Vehicles > 35 MPH : 41.5%



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176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	2	0	0	0	0	0	0	0	0	2	33	32
01:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	0	0	3	3	0	0	0	0	0	0	0	6	37	35
05:00	0	0	0	2	2	1	1	0	0	0	0	0	0	6	39	33
06:00	0	0	0	1	14	18	8	2	0	0	0	0	0	43	41	37
07:00	0	0	0	5	39	63	16	1	0	0	0	0	0	124	38	36
08:00	1	0	0	13	72	107	17	1	1	0	0	0	0	212	38	35
09:00	0	0	0	6	59	46	10	2	0	0	0	0	0	123	38	35
10:00	0	0	3	7	33	37	13	1	0	0	0	0	0	94	38	35
11:00	0	0	0	3	49	56	5	0	0	0	0	0	0	113	37	35
12 PM	1	0	2	5	32	55	14	2	0	0	0	0	0	111	38	35
13:00	0	0	1	13	52	63	10	0	0	0	0	0	0	139	38	34
14:00	0	1	0	13	79	74	15	0	0	0	0	0	0	182	38	34
15:00	0	5	11	35	196	160	17	1	0	0	0	0	0	425	37	33
16:00	0	0	15	73	267	168	22	2	0	0	0	0	0	547	37	33
17:00	143	15	53	93	228	83	9	1	0	0	0	0	0	625	33	25
18:00	0	0	3	10	129	105	16	0	0	0	0	0	0	263	37	34
19:00	0	0	2	9	51	48	11	1	0	0	0	0	0	122	38	34
20:00	0	0	2	2	27	22	3	0	0	0	0	0	0	56	37	34
21:00	0	0	0	4	17	19	2	1	0	0	0	0	0	43	38	35
22:00	0	0	0	5	13	9	4	1	0	0	0	0	0	32	39	34
23:00	0	0	1	0	5	8	1	0	0	0	0	0	0	15	38	35
Total	145	21	93	300	1370	1146	194	16	1	0	0	0	0	3286		
%	4.4%	0.6%	2.8%	9.1%	41.7%	34.9%	5.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00		10:00	08:00	08:00	08:00	08:00	06:00	08:00					08:00		
Vol.	1		3	13	72	107	17	2	1					212		
PM Peak	17:00	17:00	17:00	17:00	16:00	16:00	16:00	12:00						17:00		
Vol.	143	15	53	93	267	168	22	2						625		

Stats

15th Percentile : 27 MPH
50th Percentile : 32 MPH
85th Percentile : 37 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 32 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2516
Percent in Pace : 76.6%
Number of Vehicles > 35 MPH : 1128
Percent of Vehicles > 35 MPH : 34.3%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	1	4	5	0	0	0	0	0	0	0	10	37	34
01:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1	23	22
03:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	38	37
04:00	0	0	0	0	2	2	1	1	0	0	0	0	0	6	44	38
05:00	0	0	1	1	3	1	3	0	0	0	0	0	0	9	41	34
06:00	0	0	0	3	9	21	4	0	0	0	0	0	0	37	38	36
07:00	0	0	2	3	44	65	14	1	0	0	0	0	0	129	38	35
08:00	0	0	1	21	90	67	11	0	0	0	0	0	0	190	37	34
09:00	0	1	1	14	74	35	4	0	0	0	0	0	0	129	36	33
10:00	0	0	1	12	55	27	7	0	0	0	0	0	0	102	37	33
11:00	0	0	1	13	52	35	7	0	0	0	0	0	0	108	37	34
12 PM	0	1	2	20	74	53	14	1	0	0	0	0	0	165	38	34
13:00	0	0	1	11	59	52	4	2	0	0	0	0	0	129	37	34
14:00	0	0	0	17	75	54	10	2	0	0	0	0	0	158	37	34
15:00	0	3	16	66	207	129	17	1	0	0	0	0	0	439	37	33
16:00	39	27	53	114	278	151	6	0	0	0	0	0	0	668	35	30
17:00	207	56	63	83	145	79	9	0	0	0	0	0	0	642	33	22
18:00	0	1	3	22	118	105	20	1	0	0	0	0	0	270	38	34
19:00	0	0	2	14	37	31	11	2	0	0	0	0	0	97	38	34
20:00	0	0	0	10	30	30	5	1	0	0	0	0	0	76	38	34
21:00	0	0	0	2	16	14	5	0	0	0	0	0	0	37	38	35
22:00	0	0	0	8	12	12	5	1	0	0	0	0	0	38	39	34
23:00	0	0	0	1	7	10	3	0	0	0	0	0	0	21	38	36
Total	246	89	148	437	1392	980	160	13	0	0	0	0	0	3465		
%	7.1%	2.6%	4.3%	12.6%	40.2%	28.3%	4.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak Vol.		09:00 1	07:00 2	08:00 21	08:00 90	08:00 67	07:00 14	04:00 1						08:00 190		
PM Peak Vol.	17:00 207	17:00 56	17:00 63	16:00 114	16:00 278	16:00 151	18:00 20	13:00 2						16:00 668		

Stats

15th Percentile : 24 MPH
50th Percentile : 31 MPH
85th Percentile : 37 MPH
95th Percentile : 38 MPH

Mean Speed(Average) : 31 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2372
Percent in Pace : 68.5%
Number of Vehicles > 35 MPH : 957
Percent of Vehicles > 35 MPH : 27.6%



PRECISION
D A T A
INDUSTRIES, LLC

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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	1	3	2	3	0	0	0	0	0	0	9	41	36
01:00	0	0	0	1	0	0	1	0	0	0	0	0	0	2	42	35
02:00	0	0	0	0	1	0	1	0	0	0	0	0	0	2	42	37
03:00	0	2	0	0	0	1	0	0	0	0	0	0	0	3	36	24
04:00	0	0	0	0	0	2	0	1	0	0	0	0	0	3	46	40
05:00	0	0	1	1	6	1	0	1	0	0	0	0	0	10	36	33
06:00	0	0	0	2	26	23	3	1	0	0	0	0	0	55	38	35
07:00	0	0	0	4	50	68	10	1	0	0	0	0	0	133	38	35
08:00	2	1	4	15	94	66	11	0	0	0	0	0	0	193	37	33
09:00	0	0	0	10	59	56	14	0	0	0	0	0	0	139	38	35
10:00	0	4	0	5	31	37	10	4	0	0	0	0	0	91	39	35
11:00	0	0	0	11	57	40	6	1	0	0	0	0	0	115	37	34
12 PM	5	13	4	10	65	59	12	3	1	0	0	0	0	172	38	32
13:00	0	5	8	16	63	67	20	0	0	0	0	0	0	179	38	34
14:00	0	5	0	17	77	69	22	0	0	0	0	0	0	190	38	34
15:00	3	2	5	72	216	154	8	1	0	0	0	0	0	461	37	33
16:00	22	17	13	97	289	130	11	1	0	0	0	0	0	580	36	31
17:00	37	17	23	78	240	145	13	1	0	0	0	0	0	554	36	30
18:00	0	1	2	21	130	94	21	2	0	0	0	0	0	271	38	34
19:00	0	0	2	9	52	48	16	0	0	0	0	0	0	127	38	35
20:00	0	0	3	12	30	21	5	2	0	1	0	0	0	74	38	34
21:00	0	0	1	9	21	17	8	1	0	0	0	0	0	57	39	34
22:00	0	0	0	3	10	25	1	0	1	0	0	0	0	40	38	35
23:00	0	0	0	3	11	4	2	0	0	0	0	0	0	20	37	33
Total %	69 2.0%	67 1.9%	66 1.9%	397 11.4%	1531 44.0%	1129 32.4%	198 5.7%	20 0.6%	2 0.1%	1 0.0%	0 0.0%	0 0.0%	0 0.0%	3480		
AM Peak	08:00	10:00	08:00	08:00	08:00	07:00	09:00	10:00						08:00		
Vol.	2	4	4	15	94	68	14	4						193		
PM Peak	17:00	16:00	17:00	16:00	16:00	15:00	14:00	12:00	12:00	20:00				16:00		
Vol.	37	17	23	97	289	154	22	3	1	1				580		

Stats

15th Percentile : 28 MPH
50th Percentile : 32 MPH
85th Percentile : 37 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 33 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2660
Percent in Pace : 76.4%
Number of Vehicles > 35 MPH : 1124
Percent of Vehicles > 35 MPH : 32.3%



PRECISION
D A T A
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SB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	1	0	1	1	0	0	0	0	0	0	3	41	35
01:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
03:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
04:00	0	0	1	1	2	2	1	0	0	0	0	0	0	7	38	33
05:00	0	0	1	3	16	12	7	1	0	0	0	0	0	40	40	35
06:00	0	0	3	13	102	84	13	2	0	0	0	0	0	217	37	34
07:00	0	2	3	33	175	144	23	2	1	0	0	0	0	383	37	34
08:00	0	0	1	35	189	188	25	1	0	0	0	0	0	439	37	34
09:00	1	1	1	24	83	89	15	2	0	0	0	0	0	216	38	34
10:00	0	0	0	11	47	41	14	0	0	0	0	0	0	113	38	35
11:00	0	1	1	9	41	35	8	0	0	0	0	0	0	95	38	34
12 PM	0	0	4	14	48	37	12	1	0	0	0	0	0	116	38	34
13:00	0	0	1	3	40	39	9	1	0	0	0	0	0	93	38	35
14:00	0	0	1	13	55	46	8	0	0	0	0	0	0	123	37	34
15:00	0	0	4	10	62	60	9	1	0	0	0	0	0	146	38	34
16:00	0	0	11	13	44	35	4	0	0	0	0	0	1	108	37	32
17:00	0	0	6	22	82	55	5	0	0	0	0	0	0	170	37	33
18:00	0	0	0	10	42	40	3	0	0	0	0	0	1	96	37	34
19:00	0	0	0	7	29	22	6	0	0	0	0	0	0	64	38	34
20:00	0	0	3	6	15	10	2	1	0	0	0	0	0	37	37	33
21:00	0	0	3	4	9	12	2	0	0	0	0	0	0	30	37	33
22:00	0	0	0	7	7	6	1	1	0	0	0	0	0	22	37	33
23:00	0	0	1	0	3	3	0	0	0	0	0	0	0	7	37	33
Total	1	4	45	240	1093	963	168	13	1	0	0	0	2	2530		
%	0.0%	0.2%	1.8%	9.5%	43.2%	38.1%	6.6%	0.5%	0.0%	0.0%	0.0%	0.0%	0.1%			
AM Peak	09:00	07:00	06:00	08:00	08:00	08:00	08:00	06:00	07:00					08:00		
Vol.	1	2	3	35	189	188	25	2	1					439		
PM Peak			16:00	17:00	17:00	15:00	12:00	12:00					16:00	17:00		
Vol.			11	22	82	60	12	1					1	170		

Stats

15th Percentile : 29 MPH
50th Percentile : 33 MPH
85th Percentile : 37 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 34 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2056
Percent in Pace : 81.3%
Number of Vehicles > 35 MPH : 954
Percent of Vehicles > 35 MPH : 37.7%



PRECISION
D A T A
INDUSTRIES, LLC

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359 Old Bedford Road
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SB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	1	1	1	1	0	0	0	0	0	0	4	41	34
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
02:00	0	0	0	1	0	1	0	0	0	0	0	0	0	2	37	32
03:00	0	0	0	2	0	0	0	0	0	0	0	0	0	2	28	27
04:00	0	0	0	0	2	2	0	0	0	0	0	0	0	4	37	35
05:00	0	0	1	3	15	11	2	1	0	0	0	0	0	33	38	34
06:00	0	0	2	14	59	93	14	2	0	0	0	0	0	184	38	35
07:00	0	0	5	26	152	129	26	1	0	0	0	0	0	339	38	34
08:00	1	3	5	31	143	143	18	0	1	0	0	0	0	345	37	34
09:00	2	1	3	23	76	54	9	0	0	0	0	0	0	168	37	33
10:00	0	0	1	16	49	39	6	0	0	0	0	0	0	111	37	33
11:00	0	0	1	13	46	41	5	0	0	0	0	0	0	106	37	34
12 PM	1	3	2	22	42	31	1	0	0	0	0	0	0	102	36	32
13:00	2	1	3	21	44	30	2	1	0	0	0	0	0	104	36	32
14:00	0	1	2	23	62	45	8	1	0	0	0	0	0	142	37	33
15:00	0	0	10	31	69	22	2	1	0	0	0	0	0	135	35	31
16:00	2	4	5	29	83	49	7	0	0	0	0	0	0	179	36	32
17:00	1	0	8	19	68	47	3	0	0	0	0	0	0	146	36	32
18:00	0	0	0	5	36	34	6	0	0	0	0	0	0	81	38	35
19:00	0	0	1	7	23	16	3	0	0	0	0	0	0	50	37	33
20:00	0	1	0	10	8	10	2	0	0	0	0	0	0	31	37	32
21:00	0	0	0	8	15	6	1	0	0	0	0	0	0	30	36	32
22:00	0	0	1	4	7	5	1	0	0	0	0	0	0	18	37	32
23:00	0	1	0	5	7	3	3	0	0	0	0	0	0	19	39	32
Total	9	15	50	314	1007	813	120	7	1	0	0	0	0	2336		
%	0.4%	0.6%	2.1%	13.4%	43.1%	34.8%	5.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	08:00	07:00	08:00	07:00	08:00	07:00	06:00	08:00					08:00		
Vol.	2	3	5	31	152	143	26	2	1					345		
PM Peak	13:00	16:00	15:00	15:00	16:00	16:00	14:00	13:00						16:00		
Vol.	2	4	10	31	83	49	8	1						179		

Stats

15th Percentile :	28 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	39 MPH
Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	1820
Percent in Pace :	77.9%
Number of Vehicles > 35 MPH :	778
Percent of Vehicles > 35 MPH :	33.3%



PRECISION
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SB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/ 18	0	0	0	0	3	2	1	0	0	0	0	0	0	6	39	35
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
05:00	0	0	0	0	3	0	0	0	0	0	0	0	0	3	33	32
06:00	0	0	2	1	5	9	1	0	0	0	0	0	0	18	38	34
07:00	0	0	0	8	16	23	6	1	0	0	0	0	0	54	38	35
08:00	0	0	2	7	38	30	9	1	0	0	0	0	0	87	38	34
09:00	1	0	1	10	47	30	4	1	0	0	0	0	0	94	37	33
10:00	1	0	2	14	56	35	3	0	0	0	0	0	0	111	37	33
11:00	1	0	1	12	56	39	8	0	0	0	0	0	0	117	37	34
12 PM	0	0	8	68	99	34	3	0	0	0	0	0	0	212	34	31
13:00	1	1	10	17	54	44	6	1	0	0	0	0	0	134	37	33
14:00	0	0	2	14	57	51	5	0	0	0	0	0	0	129	37	34
15:00	0	0	0	7	52	39	5	2	1	0	0	0	0	106	37	34
16:00	0	0	2	9	44	26	8	0	0	0	0	0	0	89	37	34
17:00	0	0	6	11	48	27	7	0	1	0	0	0	0	100	37	33
18:00	0	0	6	8	39	32	3	3	0	0	0	0	0	91	37	33
19:00	1	0	1	6	32	17	4	0	0	0	0	0	0	61	37	33
20:00	0	0	1	6	13	4	0	0	0	1	0	0	0	25	35	32
21:00	0	0	4	4	14	6	0	0	0	0	0	0	0	28	35	31
22:00	0	0	0	2	11	15	3	0	0	0	0	0	0	31	38	35
23:00	0	0	0	3	8	3	0	0	0	0	0	0	0	17	39	34
Total %	5 0.3%	1 0.1%	48 3.2%	208 13.7%	696 45.9%	466 30.8%	79 5.2%	9 0.6%	2 0.1%	1 0.1%	0 0.0%	0 0.0%	0 0.0%	1515		
AM Peak	09:00		06:00	10:00	10:00	11:00	08:00	07:00						11:00		
Vol.	1		2	14	56	39	9	1						117		
PM Peak	13:00	13:00	13:00	12:00	12:00	14:00	16:00	18:00	15:00	20:00				12:00		
Vol.	1	1	10	68	99	51	8	3	1	1				212		

Stats

15th Percentile : 28 MPH
50th Percentile : 32 MPH
85th Percentile : 37 MPH
95th Percentile : 39 MPH

Mean Speed(Average) : 33 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 1162
Percent in Pace : 76.7%
Number of Vehicles > 35 MPH : 464
Percent of Vehicles > 35 MPH : 30.6%



PRECISION
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north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
01:00	0	0	0	0	3	1	0	0	0	0	0	0	0	4	36	33
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	1	1	4	0	0	0	0	0	0	0	6	37	34
06:00	0	0	1	2	6	2	2	0	0	0	0	0	0	13	39	33
07:00	0	0	0	0	12	10	5	2	0	0	0	0	0	29	41	36
08:00	0	0	1	9	25	22	6	0	0	0	0	0	0	63	38	34
09:00	0	0	1	6	44	27	6	0	0	0	0	0	0	84	37	34
10:00	0	0	1	11	48	25	4	1	0	0	0	0	0	90	37	33
11:00	0	1	0	16	56	35	3	1	0	0	0	0	0	112	37	33
12 PM	0	0	1	17	52	40	8	0	0	0	0	0	0	118	37	34
13:00	0	1	3	22	56	44	6	0	0	0	0	0	0	132	37	33
14:00	1	1	2	17	29	31	2	0	0	0	0	0	0	83	37	32
15:00	0	1	1	11	35	28	6	1	0	0	0	0	0	83	38	34
16:00	1	1	1	12	48	20	4	1	0	0	0	0	0	88	36	33
17:00	0	0	4	12	33	27	4	2	0	0	0	0	0	82	37	33
18:00	0	0	0	7	31	16	8	0	0	0	0	0	0	62	38	34
19:00	0	0	2	3	17	12	1	0	0	0	0	0	0	35	37	33
20:00	0	0	2	4	7	6	1	0	0	0	0	0	0	20	37	32
21:00	0	0	1	3	4	7	2	0	0	1	0	0	0	18	39	35
22:00	0	0	0	0	3	6	2	0	0	0	0	0	0	11	39	37
23:00	0	0	0	1	2	1	2	1	0	0	0	0	0	7	43	37
Total	2	5	21	154	513	364	72	9	0	1	0	0	0	1141		
%	0.2%	0.4%	1.8%	13.5%	45.0%	31.9%	6.3%	0.8%	0.0%	0.1%	0.0%	0.0%	0.0%			
AM Peak		11:00	06:00	11:00	11:00	11:00	08:00	07:00						11:00		
Vol.		1	1	16	56	35	6	2						112		
PM Peak	14:00	13:00	17:00	13:00	13:00	13:00	12:00	17:00		21:00				13:00		
Vol.	1	1	4	22	56	44	8	2		1				132		

Stats

15th Percentile :	28 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	40 MPH
Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	877
Percent in Pace :	76.9%
Number of Vehicles > 35 MPH :	373
Percent of Vehicles > 35 MPH :	32.7%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	1	0	0	1	0	1	0	0	0	0	0	0	0	3	36	24
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	2	1	0	1	1	1	0	0	0	0	0	0	0	6	34	21
04:00	0	0	0	1	2	2	1	0	0	0	0	0	0	6	39	35
05:00	0	0	0	4	19	21	4	1	0	0	0	0	0	49	38	35
06:00	0	0	1	10	75	92	19	0	0	0	0	0	0	197	38	35
07:00	1	0	1	25	190	168	17	0	0	0	0	0	0	402	37	34
08:00	3	9	9	38	173	189	19	1	0	0	0	0	0	441	37	34
09:00	1	0	3	18	133	95	12	0	0	0	0	0	0	262	37	34
10:00	2	1	2	16	49	34	5	1	0	0	0	0	0	110	37	33
11:00	0	0	0	16	50	25	5	0	0	0	0	0	0	96	37	33
12 PM	1	0	1	10	45	42	5	0	0	0	0	0	0	104	37	34
13:00	0	0	3	10	43	48	9	0	0	0	0	0	0	113	38	34
14:00	0	0	0	9	48	44	7	0	0	0	0	0	0	108	37	34
15:00	0	0	3	4	57	53	11	0	0	0	0	0	0	128	38	35
16:00	0	0	3	10	50	45	6	0	1	0	0	0	0	115	37	34
17:00	1	0	15	19	44	38	4	1	0	0	0	0	0	122	37	32
18:00	0	0	0	10	48	37	10	0	0	0	0	0	0	105	38	34
19:00	0	0	0	8	29	17	1	0	0	0	0	0	0	55	36	33
20:00	0	0	0	5	8	21	1	0	0	0	0	0	0	35	37	35
21:00	0	0	1	2	11	8	2	0	0	0	0	0	0	24	37	34
22:00	0	0	0	1	7	3	0	1	0	0	0	0	0	12	37	34
23:00	0	0	1	0	1	2	1	0	0	0	0	0	0	5	40	34
Total	12	11	43	218	1083	986	139	5	1	0	0	0	0	2498		
%	0.5%	0.4%	1.7%	8.7%	43.4%	39.5%	5.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	08:00	07:00	08:00	06:00	05:00						08:00		
Vol.	3	9	9	38	190	189	19	1						441		
PM Peak	12:00		17:00	17:00	15:00	15:00	15:00	17:00	16:00					15:00		
Vol.	1		15	19	57	53	11	1	1					128		

Stats

15th Percentile : 29 MPH
50th Percentile : 33 MPH
85th Percentile : 37 MPH
95th Percentile : 39 MPH

Mean Speed(Average) : 34 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2069
Percent in Pace : 82.8%
Number of Vehicles > 35 MPH : 934
Percent of Vehicles > 35 MPH : 37.4%



PRECISION
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SB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	1	0	1	1	0	0	0	0	0	0	3	41	35
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	4	0	0	0	0	0	0	0	0	4	33	32
04:00	0	0	0	0	4	3	0	0	0	0	0	0	0	7	37	34
05:00	0	0	0	4	18	15	6	0	0	0	0	0	0	43	38	35
06:00	0	0	2	11	65	85	24	1	0	0	0	0	0	188	38	35
07:00	1	0	1	27	170	180	24	1	0	0	0	0	0	404	38	34
08:00	0	0	11	55	224	139	16	2	0	0	0	0	0	447	37	33
09:00	0	1	3	28	94	83	11	1	0	0	0	0	0	221	37	34
10:00	0	0	0	19	49	28	5	0	0	0	0	0	0	101	37	33
11:00	0	0	5	15	60	22	4	1	0	0	0	0	0	107	36	32
12 PM	0	1	3	18	58	26	2	0	0	0	0	0	0	108	36	32
13:00	0	0	3	15	51	26	5	2	0	0	0	0	0	102	37	33
14:00	0	0	1	15	54	40	7	2	0	0	0	0	0	119	37	34
15:00	0	0	2	14	53	53	7	0	0	0	0	0	0	129	37	34
16:00	1	0	7	16	73	40	6	0	0	0	0	0	0	143	37	33
17:00	2	0	19	19	50	28	8	0	0	0	0	0	0	126	37	31
18:00	1	1	0	3	34	39	7	0	0	0	0	0	0	85	38	34
19:00	0	0	1	7	33	19	2	0	0	0	0	0	0	62	37	33
20:00	0	0	0	8	17	14	1	0	0	0	0	0	0	40	37	33
21:00	0	0	0	5	11	3	0	1	0	0	0	0	0	20	35	32
22:00	0	0	0	1	16	4	3	0	0	0	0	0	0	24	38	34
23:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
Total	5	3	58	281	1139	849	139	11	0	0	0	0	0	2485		
%	0.2%	0.1%	2.3%	11.3%	45.8%	34.2%	5.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	09:00	08:00	08:00	08:00	07:00	06:00	08:00						08:00		
Vol.	1	1	11	55	224	180	24	2						447		
PM Peak	17:00	12:00	17:00	17:00	16:00	15:00	17:00	13:00						16:00		
Vol.	2	1	19	19	73	53	8	2						143		

Stats

15th Percentile :	29 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	39 MPH
Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	1988
Percent in Pace :	80.0%
Number of Vehicles > 35 MPH :	829
Percent of Vehicles > 35 MPH :	33.4%



PRECISION
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SB

176038 D Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	1	0	1	0	1	0	0	0	0	0	0	3	41	32
01:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
03:00	0	0	0	1	1	1	1	0	0	0	0	0	0	4	41	34
04:00	0	0	0	0	2	2	2	0	0	0	0	0	0	6	41	37
05:00	0	0	1	3	14	16	3	1	0	0	0	0	0	38	38	35
06:00	1	0	3	13	76	91	22	2	1	0	0	0	0	209	38	35
07:00	0	0	0	30	174	141	25	3	0	0	0	0	0	373	38	34
08:00	2	0	10	57	206	167	22	0	0	0	0	0	0	464	37	33
09:00	0	1	6	36	104	111	10	0	0	0	0	0	0	268	37	33
10:00	0	0	4	15	54	35	6	0	0	0	0	0	0	114	37	33
11:00	0	1	0	14	65	48	3	0	0	0	0	0	0	131	37	33
12 PM	0	0	1	16	55	45	12	1	0	0	0	0	0	130	38	34
13:00	0	0	2	23	40	31	10	0	0	0	0	0	0	106	38	33
14:00	4	2	0	20	54	40	9	2	0	0	0	0	0	131	37	33
15:00	0	0	2	30	70	41	8	0	0	0	0	0	0	151	37	33
16:00	0	0	4	9	68	51	15	2	0	0	0	0	0	149	38	34
17:00	1	0	6	23	82	62	9	0	0	0	0	0	0	183	37	33
18:00	0	0	0	18	46	37	6	0	0	0	0	0	0	107	37	33
19:00	0	0	2	14	27	20	1	1	0	0	0	0	0	65	37	33
20:00	0	0	0	6	16	9	2	0	0	0	0	0	0	33	37	33
21:00	0	0	1	4	15	10	1	1	0	0	0	0	0	32	37	33
22:00	0	0	0	4	9	3	1	1	0	0	0	0	0	18	37	33
23:00	0	0	0	1	3	2	2	0	0	0	0	0	0	8	41	35
Total	8	4	43	338	1183	963	171	14	1	0	0	0	0	2725		
%	0.3%	0.1%	1.6%	12.4%	43.4%	35.3%	6.3%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	08:00	08:00	08:00	08:00	07:00	07:00	06:00					08:00		
Vol.	2	1	10	57	206	167	25	3	1					464		
PM Peak	14:00	14:00	17:00	15:00	17:00	17:00	16:00	14:00						17:00		
Vol.	4	2	6	30	82	62	15	2						183		

Stats

15th Percentile : 29 MPH
50th Percentile : 33 MPH
85th Percentile : 37 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 34 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2146
Percent in Pace : 78.8%
Number of Vehicles > 35 MPH : 956
Percent of Vehicles > 35 MPH : 35.1%



PRECISION
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176038 D Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/5/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Thu	
12:00	3		36		3		30		6	66		
12:15	2		36		0		25		2	61		
12:30	2		43		0		29		2	72		
12:45	2	9	36	151	0	3	32	116	2	68	267	
01:00	1		39		2		20		3	59		
01:15	1		32		0		29		1	61		
01:30	0		23		0		16		0	39		
01:45	1	3	29	123	0	2	28	93	1	57	216	
02:00	0		40		0		31		0	71		
02:15	0		29		0		33		0	62		
02:30	1		56		1		29		2	85		
02:45	1	2	53	178	0	1	30	123	1	83	301	
03:00	0		97		0		22		0	119		
03:15	1		94		1		51		2	145		
03:30	0		95		0		39		0	134		
03:45	0	1	149	435	1	2	34	146	1	183	581	
04:00	1		154		0		21		1	175		
04:15	0		156		3		32		3	188		
04:30	4		187		0		33		4	220		
04:45	0	5	209	706	4	7	22	108	4	231	814	
05:00	1		170		2		50		3	220		
05:15	0		143		5		38		5	181		
05:30	1		137		20		35		21	172		
05:45	6	8	156	606	13	40	47	170	19	203	776	
06:00	3		108		29		31		32	139		
06:15	8		88		53		24		61	112		
06:30	13		55		53		13		66	68		
06:45	10	34	46	297	82	217	28	96	92	74	393	
07:00	25		50		91		22		116	72		
07:15	33		33		88		19		121	52		
07:30	24		35		107		12		131	47		
07:45	30	112	34	152	97	383	11	64	127	45	216	
08:00	52		18		119		11		171	29		
08:15	40		13		94		14		134	27		
08:30	43		23		122		6		165	29		
08:45	62	197	16	70	104	439	6	37	166	22	107	
09:00	39		20		71		11		110	31		
09:15	30		16		63		9		93	25		
09:30	32		13		43		3		75	16		
09:45	34	135	16	65	39	216	7	30	73	23	95	
10:00	12		12		30		1		42	13		
10:15	26		7		30		12		56	19		
10:30	17		9		29		6		46	15		
10:45	21	76	4	32	24	113	3	22	45	7	54	
11:00	31		10		22		3		53	13		
11:15	26		3		19		2		45	5		
11:30	29		2		28		1		57	3		
11:45	42	128	1	16	26	95	1	7	68	2	23	
Total	710		2831		1518		1012		2228	3843		
Percent	31.9%		73.7%		68.1%		26.3%					
Day Total			3541				2530			6071		
Peak	08:00	-	04:15	-	08:00	-	05:00	-	08:00	-	04:15	-
Vol.	197	-	722	-	439	-	170	-	636	-	859	-
P.H.F.	0.794		0.864		0.900		0.833		0.930		0.930	



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176038 D Volume
Site Code: TBA

Start	NB				SB				Combin		4/6/2018	
Time	A.M.		P.M.		A.M.	P.M.			A.M.	P.M.	Fri	
12:00	8		35		3	18			11	53		
12:15	1		28		1	27			2	55		
12:30	4		43		0	29			4	72		
12:45	0	13	31	137	0	28	102		0	59	239	
01:00	3		35		0	16			3	51		
01:15	1		37		0	33			1	70		
01:30	1		31		1	29			2	60		
01:45	0	5	41	144	0	26	104		0	67	248	
02:00	0		40		0	28			0	68		
02:15	0		51		0	28			0	79		
02:30	0		73		0	42			0	115		
02:45	0	0	69	233	2	44	142		2	113	375	
03:00	1		117		1	31			2	148		
03:15	1		157		0	32			1	189		
03:30	0		173		0	38			0	211		
03:45	0	2	142	589	1	34	135		1	176	724	
04:00	0		112		1	43			1	155		
04:15	0		149		0	49			0	198		
04:30	3		105		0	39			3	144		
04:45	1	4	116	482	3	48	179		4	164	661	
05:00	1		123		3	46			4	169		
05:15	0		157		4	31			4	188		
05:30	1		95		12	36			13	131		
05:45	3	5	114	489	14	33	146		17	147	635	
06:00	4		66		26	34			30	100		
06:15	5		54		33	22			38	76		
06:30	11		41		58	13			69	54		
06:45	16	36	37	198	67	12	81		83	49	279	
07:00	23		31		79	15			102	46		
07:15	29		15		59	12			88	27		
07:30	31		22		101	8			132	30		
07:45	34	117	21	89	100	339	15	50	134	36	139	
08:00	30		20		80	8			110	28		
08:15	40		16		95	10			135	26		
08:30	47		14		94	7			141	21		
08:45	48	165	8	58	76	345	6	31	124	14	89	
09:00	31		9		58	9			89	18		
09:15	31		11		43	4			74	15		
09:30	35		12		33	14			68	26		
09:45	34	131	10	42	34	168	3	30	68	13	72	
10:00	16		15		26	6			42	21		
10:15	28		13		31	3			59	16		
10:30	24		8		25	7			49	15		
10:45	28	96	13	49	29	111	2	18	57	15	67	
11:00	31		8		26	6			57	14		
11:15	27		6		27	6			54	12		
11:30	27		10		27	6			54	16		
11:45	32	117	4	28	26	106	1	19	58	5	47	
Total	691		2538		1299	1037			1990	3575		
Percent	34.7%		71.0%		65.3%	29.0%						
Day Total		3229			2336				5565			
Peak	08:15	-	03:00	-	07:30	-	04:15	-	07:45	-	03:30	-
Vol.	166	-	589	-	376	-	182	-	520	-	740	-
P.H.F.	0.865		0.851		0.931		0.929		0.922		0.877	



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 D Volume
Site Code: TBA

Start	NB		SB		Combin		ed		4/7/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Sat	
12:00	3	31	4	35	7	66				
12:15	8	32	2	63	10	95				
12:30	1	33	0	70	1	103				
12:45	2	17	0	44	2	61	20	325		
01:00	1	31	0	27	1	58				
01:15	3	45	0	41	3	86				
01:30	1	34	0	29	1	63				
01:45	0	24	0	37	0	61	5	268		
02:00	1	55	0	32	1	87				
02:15	0	44	0	28	0	72				
02:30	1	41	0	36	1	77				
02:45	0	41	0	33	0	74	2	310		
03:00	0	40	0	30	0	70				
03:15	0	46	0	26	0	72				
03:30	1	53	0	23	1	76				
03:45	0	42	0	27	0	69	1	287		
04:00	0	41	2	22	2	63				
04:15	0	26	0	22	0	48				
04:30	0	37	0	24	0	61				
04:45	3	25	0	21	3	46	5	218		
05:00	0	35	0	25	0	60				
05:15	1	41	0	29	1	70				
05:30	0	26	2	22	2	48				
05:45	3	29	1	24	4	53	7	231		
06:00	0	27	2	29	2	56				
06:15	2	22	4	27	6	49				
06:30	1	22	5	14	6	36				
06:45	6	8	7	21	13	29	27	170		
07:00	9	13	6	23	15	36				
07:15	4	15	17	13	21	28				
07:30	6	23	14	16	20	39				
07:45	16	9	17	9	33	18	89	121		
08:00	16	17	18	4	34	21				
08:15	13	9	24	6	37	15				
08:30	11	5	21	11	32	16				
08:45	22	9	24	4	46	13	149	65		
09:00	14	7	14	8	28	15				
09:15	28	11	28	7	56	18				
09:30	27	14	22	7	49	21				
09:45	26	12	30	6	56	18	189	72		
10:00	16	13	24	5	40	18				
10:15	35	9	32	9	67	18				
10:30	32	7	24	8	56	15				
10:45	30	7	31	9	61	16	224	67		
11:00	40	11	33	3	73	14				
11:15	28	9	24	2	52	11				
11:30	44	6	25	8	69	14				
11:45	29	11	35	4	64	15	258	54		
Total	484	1165	492	1023	976	2188				
Percent	49.6%	53.2%	50.4%	46.8%						
Day Total		1649		1515		3164				
Peak	10:45	-	03:15	-	10:15	-	11:00	-	12:00	-
Vol.	142	-	182	-	120	-	258	-	325	-
P.H.F.	0.807	-	0.858	-	0.909	-	0.884	-	0.789	-



PRECISION
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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 D Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/8/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Sun	
12:00	4		38		1		29		5	67		
12:15	4		31		0		29		4	60		
12:30	2		39		0		36		2	75		
12:45	3	13	36	144	0	1	24	118	3	60	262	
01:00	2		34		1		35		3	69		
01:15	1		26		0		34		1	60		
01:30	1		31		1		28		2	59		
01:45	0	4	38	129	2	4	35	132	2	73	261	
02:00	1		33		0		20		1	53		
02:15	0		27		0		19		0	46		
02:30	1		43		0		28		1	71		
02:45	3	5	32	135	0	0	16	83	3	48	218	
03:00	1		27		0		14		1	41		
03:15	0		28		0		26		0	54		
03:30	0		23		0		19		0	42		
03:45	1	2	29	107	0	0	24	83	1	53	190	
04:00	0		23		0		28		0	51		
04:15	0		38		0		25		0	63		
04:30	0		38		0		15		0	53		
04:45	0	0	18	117	0	0	20	88	0	38	205	
05:00	0		34		1		16		1	50		
05:15	0		30		2		21		2	51		
05:30	2		21		1		19		3	40		
05:45	1	3	27	112	2	6	26	82	3	53	194	
06:00	0		20		2		12		2	32		
06:15	1		24		5		18		6	42		
06:30	0		21		1		17		1	38		
06:45	2	3	23	88	5	13	15	62	7	38	150	
07:00	7		16		2		12		9	28		
07:15	6		20		6		10		12	30		
07:30	6		15		10		10		16	25		
07:45	3	22	17	68	11	29	3	35	14	20	103	
08:00	8		16		12		8		20	24		
08:15	11		4		16		4		27	8		
08:30	13		20		22		5		35	25		
08:45	23	55	8	48	13	63	3	20	36	11	68	
09:00	19		4		19		6		38	10		
09:15	19		7		19		5		38	12		
09:30	23		6		22		4		45	10		
09:45	17	78	11	28	24	84	3	18	41	14	46	
10:00	23		8		22		5		45	13		
10:15	29		7		21		1		50	8		
10:30	37		3		25		3		62	6		
10:45	26	115	2	20	22	90	2	11	48	4	31	
11:00	29		4		22		3		51	7		
11:15	32		5		42		1		74	6		
11:30	28		2		22		2		50	4		
11:45	36	125	1	12	26	112	1	7	62	2	19	
Total	425		1008		402		739		827	1747		
Percent	51.4%		57.7%		48.6%		42.3%					
Day Total		1433			1141				2574			
Peak	11:00	-	12:00	-	11:00	-	01:00	-	11:00	-	00:15	-
Vol.	125	-	144	-	112	-	132	-	237	-	264	-
P.H.F.	0.868		0.923		0.667		0.943		0.801		0.880	



PRECISION
D A T A
INDUSTRIES, LLC

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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 D Volume
Site Code: TBA

Start	NB				SB				Combin		4/9/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Mon	
12:00	0		27		1		26		1	53		
12:15	1		25		1		26		2	51		
12:30	1		31		1		29		2	60		
12:45	0	2	28	111	0	3	23	104	0	5	51	215
01:00	0		31		0		32		0	63		
01:15	0		38		0		25		0	63		
01:30	0		36		0		31		0	67		
01:45	1	1	34	139	0	0	25	113	1	59	252	
02:00	1		44		0		20		1	64		
02:15	0		35		0		27		0	62		
02:30	0		33		0		29		0	62		
02:45	0	1	70	182	0	0	32	108	0	1	102	290
03:00	0		99		1		30		1	129		
03:15	0		107		0		37		0	144		
03:30	1		111		0		27		1	138		
03:45	0	1	108	425	5	6	34	128	5	7	142	553
04:00	0		129		0		24		0	153		
04:15	2		131		0		26		2	157		
04:30	2		135		4		25		6	160		
04:45	2	6	152	547	2	6	40	115	4	12	192	662
05:00	0		169		5		33		5	202		
05:15	3		188		13		33		16	221		
05:30	2		146		9		28		11	174		
05:45	1	6	122	625	22	49	28	122	23	55	150	747
06:00	5		83		22		27		27	110		
06:15	8		77		41		34		49	111		
06:30	11		63		64		22		75	85		
06:45	19	43	40	263	70	197	22	105	89	240	62	368
07:00	23		43		89		21		112	64		
07:15	34		28		75		15		109	43		
07:30	32		29		118		12		150	41		
07:45	35	124	22	122	120	402	7	55	155	526	29	177
08:00	48		18		104		13		152	31		
08:15	53		15		117		9		170	24		
08:30	49		11		124		6		173	17		
08:45	62	212	12	56	96	441	7	35	158	653	19	91
09:00	47		11		108		10		155	21		
09:15	31		11		61		7		92	18		
09:30	27		7		53		4		80	11		
09:45	18	123	14	43	40	262	3	24	58	385	17	67
10:00	21		10		37		4		58	14		
10:15	24		9		22		2		46	11		
10:30	25		6		31		4		56	10		
10:45	24	94	7	32	20	110	2	12	44	204	9	44
11:00	23		5		21		2		44	7		
11:15	26		3		23		2		49	5		
11:30	33		3		27		0		60	3		
11:45	31	113	4	15	25	96	1	5	56	209	5	20
Total	726		2560		1572		926		2298		3486	
Percent	31.6%		73.4%		68.4%		26.6%					
Day Total			3286				2498				5784	
Peak	08:00	-	04:45	-	07:45	-	04:45	-	08:15	-	04:45	-
Vol.	212	-	655	-	465	-	134	-	656	-	789	-
P.H.F.	0.855		0.871		0.938		0.838		0.948		0.893	



PRECISION
D A T A
INDUSTRIES, LLC

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359 Old Bedford Road
north of Virginia Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 D Volume
Site Code: TBA

Start	NB				SB				Combin		4/10/201	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	8	Tue
12:00	6		43		1		25		7	68		
12:15	2		31		1		33		3	64		
12:30	1		43		1		27		2	70		
12:45	1	10	48	165	0	3	23	108	1	71	273	
01:00	0		33		0		25		0	58		
01:15	2		31		0		29		2	60		
01:30	0		29		0		20		0	49		
01:45	0	2	36	129	0	0	28	102	0	64	231	
02:00	0		38		0		34		0	72		
02:15	0		24		0		32		0	56		
02:30	0		47		0		21		0	68		
02:45	1	1	49	158	0	0	32	119	1	81	277	
03:00	0		95		1		21		1	116		
03:15	1		107		1		37		2	144		
03:30	0		107		1		43		1	150		
03:45	1	2	130	439	1	4	28	129	2	158	568	
04:00	0		155		2		47		2	202		
04:15	0		165		3		38		3	203		
04:30	3		182		1		26		4	208		
04:45	3	6	166	668	1	7	32	143	4	198	811	
05:00	2		180		5		40		7	220		
05:15	1		179		11		29		12	208		
05:30	4		179		9		33		13	212		
05:45	2	9	104	642	18	43	24	126	20	128	768	
06:00	2		96		30		24		32	120		
06:15	11		70		36		23		47	93		
06:30	6		62		53		21		59	83		
06:45	18	37	42	270	69	188	17	85	87	59	355	
07:00	21		34		79		19		100	53		
07:15	39		30		92		18		131	48		
07:30	29		19		125		12		154	31		
07:45	40	129	14	97	108	404	13	62	148	27	159	
08:00	43		21		96		12		139	33		
08:15	50		18		133		14		183	32		
08:30	47		19		118		13		165	32		
08:45	50	190	18	76	100	447	1	40	150	19	116	
09:00	44		6		72		11		116	17		
09:15	35		8		59		6		94	14		
09:30	27		12		59		1		86	13		
09:45	23	129	11	37	31	221	2	20	54	13	57	
10:00	25		9		28		6		53	15		
10:15	22		10		21		7		43	17		
10:30	30		12		27		8		57	20		
10:45	25	102	7	38	25	101	3	24	50	10	62	
11:00	21		9		27		1		48	10		
11:15	24		4		28		1		52	5		
11:30	32		4		22		0		54	4		
11:45	31	108	4	21	30	107	0	2	61	4	23	
Total	725		2740		1525		960		2250	3700		
Percent	32.2%		74.1%		67.8%		25.9%					
Day Total		3465			2485				5950			
Peak	08:15	-	04:30	-	07:30	-	03:30	-	08:00	-	04:45	-
Vol.	191	-	707	-	462	-	156	-	637	-	838	-
P.H.F.	0.955		0.971		0.868		0.830		0.870		0.952	



PRECISION
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359 Old Bedford Road
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176038 D Volume
Site Code: TBA

Start	NB				SB				Combin		4/11/201	
Time	A.M.		P.M.		A.M.	P.M.			A.M.	P.M.	8	Wed
12:00	4		41		3	39			7	80		
12:15	2		31		0	31			2	62		
12:30	2		48		0	29			2	77		
12:45	1	9	52	172	0	31	130		1	83	302	
01:00	2		43		0	30			2	73		
01:15	0		35		1	29			1	64		
01:30	0		48		0	24			0	72		
01:45	0	2	53	179	0	23	106		0	76	285	
02:00	1		36		0	32			1	68		
02:15	0		47		0	29			0	76		
02:30	0		52		0	38			0	90		
02:45	1	2	55	190	1	32	131		2	87	321	
03:00	0		104		2	47			2	151		
03:15	0		97		1	36			1	133		
03:30	1		123		0	31			1	154		
03:45	2	3	137	461	1	37	151		3	174	612	
04:00	1		151		2	29			3	180		
04:15	0		141		1	41			1	182		
04:30	2		133		1	41			3	174		
04:45	0	3	155	580	2	38	149		2	193	729	
05:00	2		167		2	42			4	209		
05:15	3		159		7	55			10	214		
05:30	3		117		13	43			16	160		
05:45	2	10	111	554	16	43	183		18	154	737	
06:00	6		80		27	25			33	105		
06:15	12		80		51	28			63	108		
06:30	18		69		58	35			76	104		
06:45	19	55	42	271	73	19	107		92	61	378	
07:00	22		41		86	21			108	62		
07:15	32		32		86	19			118	51		
07:30	37		29		93	13			130	42		
07:45	42	133	25	127	108	12	65		150	37	192	
08:00	47		23		118	11			165	34		
08:15	47		18		114	10			161	28		
08:30	48		18		114	6			162	24		
08:45	51	193	15	74	118	6	33		169	21	107	
09:00	55		13		83	11			138	24		
09:15	28		17		72	6			100	23		
09:30	25		18		58	10			83	28		
09:45	31	139	9	57	55	5	32		86	14	89	
10:00	14		16		27	5			41	21		
10:15	18		8		35	3			53	11		
10:30	28		9		20	5			48	14		
10:45	31	91	7	40	32	114	5	18	63	12	58	
11:00	35		5		33	7			68	12		
11:15	18		3		33	1			51	4		
11:30	28		8		32	0			60	8		
11:45	34	115	4	20	33	131	0	8	67	4	28	
Total	755		2725		1612	1113			2367	3838		
Percent	31.9%		71.0%		68.1%	29.0%						
Day Total			3480			2725				6205		
Peak	08:15	-	04:30	-	08:00	-	05:00	-	08:00	-	04:30	-
Vol.	201	-	614	-	464	-	183	-	657	-	790	-
P.H.F.	0.914		0.919		0.983		0.832		0.972		0.923	



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	5	0	0	0	0	0	0	0	0	0	0	0	5
01:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
02:00	0	2	2	0	0	0	0	0	0	0	0	0	0	4
03:00	0	5	0	0	1	0	0	0	0	0	0	0	0	6
04:00	1	8	5	0	0	0	0	0	0	0	0	0	0	14
05:00	0	47	12	0	1	0	0	0	0	0	0	0	0	60
06:00	1	151	23	1	2	1	0	1	0	0	0	0	0	180
07:00	0	310	40	2	4	1	1	0	0	0	0	0	0	358
08:00	2	339	32	4	8	1	1	0	0	0	0	0	0	387
09:00	0	237	22	3	8	0	1	1	0	0	0	0	0	272
10:00	0	153	28	1	8	1	0	0	1	0	0	0	0	192
11:00	1	138	22	1	4	1	0	0	0	0	0	0	0	167
12 PM	1	145	28	0	8	2	0	1	0	1	0	0	0	186
13:00	2	137	22	0	9	0	0	1	0	0	0	0	0	171
14:00	0	146	27	0	3	0	0	1	0	0	0	0	0	177
15:00	1	150	48	3	3	0	0	2	0	0	0	0	0	207
16:00	1	155	28	0	2	0	0	2	0	0	0	0	0	188
17:00	1	179	17	2	1	0	0	0	0	0	0	0	0	200
18:00	1	124	15	0	5	2	0	0	0	0	0	0	0	147
19:00	0	105	11	0	0	1	0	0	0	0	0	0	0	117
20:00	0	57	6	0	3	0	0	0	0	0	0	0	0	66
21:00	0	79	8	0	0	0	0	0	0	0	0	0	0	87
22:00	0	34	7	0	0	0	0	0	0	0	0	0	0	41
23:00	0	22	3	0	0	0	0	0	0	0	0	0	0	25
Total	12	2730	407	17	70	10	3	9	1	1	0	0	0	3260
Percent	0.4%	83.7%	12.5%	0.5%	2.1%	0.3%	0.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	07:00	08:00	08:00	06:00	07:00	06:00	10:00					08:00
Vol.	2	339	40	4	8	1	1	1	1					387
PM Peak	13:00	17:00	15:00	15:00	13:00	12:00		15:00		12:00				15:00
Vol.	2	179	48	3	9	2		2		1				207



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	6	0	0	0	0	0	0	0	0	0	0	0	6
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
03:00	0	3	0	0	1	0	0	0	0	0	0	0	0	4
04:00	0	6	1	0	0	0	0	0	0	0	0	0	0	7
05:00	0	39	11	0	2	0	0	0	0	0	0	0	0	52
06:00	0	134	24	0	1	1	0	1	0	0	0	0	0	161
07:00	3	297	39	2	5	0	0	1	0	0	0	0	0	347
08:00	2	301	32	5	2	0	0	0	0	0	0	0	0	342
09:00	1	214	37	2	16	2	0	0	1	0	0	0	0	273
10:00	2	149	23	0	6	0	0	0	0	0	0	0	0	180
11:00	1	156	31	0	7	1	0	0	1	0	0	0	0	197
12 PM	0	150	30	2	6	0	0	0	0	0	0	0	0	188
13:00	0	149	24	0	2	0	0	0	0	0	0	0	0	175
14:00	0	139	35	3	8	1	0	0	0	0	0	0	0	186
15:00	1	180	28	1	4	0	0	0	0	0	0	0	0	214
16:00	1	161	16	0	4	0	0	0	0	0	0	0	0	182
17:00	1	168	14	0	2	1	0	0	0	0	0	0	0	186
18:00	0	141	11	0	3	0	0	2	0	0	0	0	0	157
19:00	0	91	7	0	1	0	0	0	0	0	0	0	0	99
20:00	0	60	6	0	1	0	0	0	0	0	0	0	0	67
21:00	0	52	5	1	1	0	0	0	1	0	0	0	0	60
22:00	0	25	5	0	0	0	0	0	0	0	0	0	0	30
23:00	0	31	2	0	0	0	0	0	0	0	0	0	0	33
Total	12	2657	381	16	72	6	0	4	3	0	0	0	0	3151
Percent	0.4%	84.3%	12.1%	0.5%	2.3%	0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	08:00	07:00	08:00	09:00	09:00		06:00	09:00					07:00
Vol.	3	301	39	5	16	2		1	1					347
PM Peak	15:00	15:00	14:00	14:00	14:00	14:00		18:00	21:00					15:00
Vol.	1	180	35	3	8	1		2	1					214



PRECISION
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/07/1														
8	0	6	4	0	0	0	0	0	0	0	0	0	0	10
01:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	3	1	0	1	0	0	0	0	0	0	0	0	5
05:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
06:00	0	24	6	0	3	1	0	0	0	0	0	0	0	34
07:00	0	56	3	0	1	1	0	0	0	0	0	0	0	61
08:00	0	95	12	0	2	0	0	0	0	0	0	0	0	109
09:00	0	168	18	0	2	1	0	1	0	0	0	0	0	190
10:00	1	160	12	0	2	0	0	0	0	0	0	0	0	175
11:00	1	160	24	0	2	0	0	0	0	0	0	0	0	187
12 PM	2	197	14	0	0	0	0	0	0	0	0	0	0	213
13:00	2	211	23	0	2	1	0	1	0	0	0	0	0	240
14:00	4	175	13	0	1	0	0	0	0	0	0	0	0	193
15:00	3	166	12	0	0	0	0	0	0	0	0	0	0	181
16:00	3	157	26	0	1	0	0	0	0	0	0	0	0	187
17:00	6	127	19	0	1	0	0	0	0	0	0	0	0	153
18:00	0	132	5	0	1	0	0	0	0	0	0	0	0	138
19:00	0	86	12	0	0	0	0	0	0	0	0	0	0	98
20:00	0	69	6	0	1	0	0	0	0	0	0	0	0	76
21:00	0	55	6	0	0	0	0	0	0	0	0	0	0	61
22:00	0	48	6	0	0	0	0	0	0	0	0	0	0	54
23:00	0	30	5	0	1	0	0	0	0	0	0	0	0	36
Total	22	2137	228	0	21	4	0	2	0	0	0	0	0	2414
Percent	0.9%	88.5%	9.4%	0.0%	0.9%	0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	09:00	11:00		06:00	06:00		09:00						09:00
Vol.	1	168	24		3	1		1						190
PM Peak	17:00	13:00	16:00		13:00	13:00		13:00						13:00
Vol.	6	211	26		2	1		1						240



PRECISION
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/08/1														
8	0	10	0	0	0	0	0	0	0	0	0	0	0	10
01:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
06:00	0	25	4	0	0	0	0	0	0	0	0	0	0	29
07:00	0	39	8	0	1	0	0	0	0	0	0	0	0	48
08:00	0	83	9	0	1	0	0	0	0	0	0	0	0	93
09:00	0	120	23	0	2	0	0	0	0	0	0	0	0	145
10:00	1	118	13	0	0	0	0	0	0	0	0	0	0	132
11:00	4	164	17	0	0	1	0	0	0	0	0	0	0	186
12 PM	1	171	18	0	1	0	0	0	0	0	0	0	0	191
13:00	2	187	25	0	0	1	0	0	0	0	0	0	0	215
14:00	3	137	14	0	3	0	0	0	0	0	0	0	0	157
15:00	2	169	10	0	4	0	0	0	0	0	0	0	0	185
16:00	0	120	13	0	0	0	0	0	0	0	0	0	0	133
17:00	0	134	13	0	1	0	0	0	0	0	0	0	0	148
18:00	0	103	6	0	0	1	0	0	0	0	0	0	0	110
19:00	0	76	7	0	1	0	0	0	0	0	0	0	0	84
20:00	0	43	3	0	1	0	0	0	0	0	0	0	0	47
21:00	0	27	1	0	0	0	0	0	0	0	0	0	0	28
22:00	0	9	3	0	0	0	0	0	0	0	0	0	0	12
23:00	0	10	0	0	0	0	0	0	0	0	0	0	0	10
Total	13	1757	189	0	15	3	0	0	0	0	0	0	0	1977
Percent	0.7%	88.9%	9.6%	0.0%	0.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	11:00	11:00	09:00		09:00	11:00								11:00
Vol.	4	164	23		2	1								186
PM Peak	14:00	13:00	13:00		15:00	13:00								13:00
Vol.	3	187	25		4	1								215



PRECISION
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	1	0	0	0	0	0	0	0	0	0	0	0	1
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	1	2	1	0	1	1	0	0	0	0	0	0	0	6
04:00	1	5	2	0	0	0	0	0	0	0	0	0	0	8
05:00	0	55	8	0	2	0	0	0	0	0	0	0	0	65
06:00	1	148	25	0	6	1	0	1	0	0	0	0	0	182
07:00	1	312	48	2	6	1	0	0	0	0	0	0	0	370
08:00	0	323	45	3	7	2	1	1	0	0	0	0	0	382
09:00	1	192	37	1	12	1	0	0	0	0	0	0	0	244
10:00	2	161	31	0	6	1	0	0	0	0	0	0	0	201
11:00	0	122	13	0	3	0	0	0	0	0	0	0	0	138
12 PM	1	134	24	0	5	1	0	0	1	0	0	0	0	166
13:00	0	120	30	0	2	0	0	0	0	0	0	0	0	152
14:00	2	127	27	1	4	0	0	0	0	0	0	0	0	161
15:00	3	158	33	2	4	1	0	0	0	0	0	0	0	201
16:00	0	150	22	0	2	2	0	1	0	0	0	0	0	177
17:00	2	179	19	1	4	2	0	0	0	0	0	0	0	207
18:00	0	148	16	1	1	0	0	0	0	0	0	0	0	166
19:00	0	95	12	1	1	0	0	0	0	0	0	0	0	109
20:00	0	55	4	0	1	0	0	0	0	0	0	0	0	60
21:00	0	41	6	0	0	0	0	0	0	0	0	0	0	47
22:00	0	21	4	0	0	0	0	0	0	0	0	0	0	25
23:00	0	10	1	0	0	0	0	0	0	0	0	0	0	11
Total	15	2562	408	12	67	13	1	3	1	0	0	0	0	3082
Percent	0.5%	83.1%	13.2%	0.4%	2.2%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	08:00	07:00	08:00	09:00	08:00	08:00	06:00						08:00
Vol.	2	323	48	3	12	2	1	1						382
PM Peak	15:00	17:00	15:00	15:00	12:00	16:00		16:00	12:00					17:00
Vol.	3	179	33	2	5	2		1	1					207



PRECISION
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	4	0	0	1	0	0	0	0	0	0	0	0	5
04:00	0	13	2	0	0	0	0	0	0	0	0	0	0	15
05:00	0	54	8	0	3	1	0	0	0	0	0	0	0	66
06:00	1	131	28	1	2	1	0	1	0	0	0	0	0	165
07:00	2	313	53	2	4	6	0	0	0	0	0	0	0	380
08:00	2	304	43	4	7	2	0	0	0	0	0	0	0	362
09:00	0	188	37	0	3	0	0	0	0	0	0	0	0	228
10:00	0	160	29	2	6	0	0	1	0	0	0	0	0	198
11:00	0	118	30	1	10	0	0	1	0	0	0	0	0	160
12 PM	0	166	24	0	10	0	0	1	1	0	0	0	0	202
13:00	0	129	28	1	6	1	0	0	0	0	0	0	0	165
14:00	1	129	34	0	7	0	0	0	0	0	0	0	0	171
15:00	1	172	37	1	1	0	0	0	0	0	0	0	0	212
16:00	1	160	26	1	6	2	0	0	0	0	0	0	0	196
17:00	3	178	21	1	2	1	0	1	0	0	0	0	0	207
18:00	0	137	24	0	2	0	0	0	0	0	0	0	0	163
19:00	1	90	12	0	1	0	0	0	0	0	0	0	0	104
20:00	0	63	9	0	2	0	0	0	0	0	0	0	0	74
21:00	1	47	2	0	0	0	0	0	0	0	0	0	0	50
22:00	0	21	5	0	1	0	0	0	0	0	0	0	0	27
23:00	0	17	0	0	0	0	0	0	0	0	0	0	0	17
Total	13	2599	452	14	74	14	0	5	1	0	0	0	0	3172
Percent	0.4%	81.9%	14.2%	0.4%	2.3%	0.4%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	07:00	08:00	11:00	07:00		06:00						07:00
Vol.	2	313	53	4	10	6		1						380
PM Peak	17:00	17:00	15:00	13:00	12:00	16:00		12:00	12:00					15:00
Vol.	3	178	37	1	10	2		1	1					212



PRECISION
D A T A
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	4	0	0	0	0	0	0	0	0	0	0	0	4
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	1	0	1	0	0	0	0	0	0	0	0	0	2
03:00	0	4	0	0	2	0	0	0	0	0	0	0	0	6
04:00	1	9	5	0	0	0	0	0	0	0	0	0	0	15
05:00	0	49	8	0	2	0	0	0	0	0	0	0	0	59
06:00	0	144	21	1	5	1	0	1	0	0	0	0	0	173
07:00	0	316	59	1	8	1	0	0	0	0	0	0	0	385
08:00	6	301	49	4	8	2	0	0	0	0	0	0	0	370
09:00	3	235	33	3	5	2	0	0	1	0	0	0	0	282
10:00	2	149	34	1	8	2	0	0	0	0	0	0	0	196
11:00	0	130	21	2	6	0	0	2	0	1	0	0	0	162
12 PM	1	160	31	1	5	1	0	1	2	0	0	0	0	202
13:00	2	144	25	0	3	0	0	1	0	0	0	0	0	175
14:00	3	143	23	2	7	0	0	0	1	0	0	0	0	179
15:00	0	180	42	2	9	1	0	0	0	0	0	0	0	234
16:00	1	191	34	0	1	2	0	0	0	0	0	0	0	229
17:00	0	179	25	0	4	0	0	0	0	0	0	0	0	208
18:00	1	142	24	0	5	0	0	0	0	0	0	0	0	172
19:00	0	104	16	3	1	0	0	0	0	0	0	0	0	124
20:00	0	74	9	1	1	1	0	0	0	0	0	0	0	86
21:00	0	57	7	0	0	0	0	0	0	0	0	0	0	64
22:00	0	21	2	0	1	0	0	0	0	0	0	0	0	24
23:00	0	22	2	0	0	0	0	0	0	0	0	0	0	24
Total	20	2759	470	22	81	13	0	5	4	1	0	0	0	3375
Percent	0.6%	81.7%	13.9%	0.7%	2.4%	0.4%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	07:00	08:00	07:00	08:00		11:00	09:00	11:00				07:00
Vol.	6	316	59	4	8	2		2	1	1				385
PM Peak	14:00	16:00	15:00	19:00	15:00	16:00		12:00	12:00					15:00
Vol.	3	191	42	3	9	2		1	2					234



PRECISION
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west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	8	1	0	0	0	0	0	0	0	0	0	0	9
01:00	0	2	3	0	0	0	0	0	0	0	0	0	0	5
02:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	4	2	0	0	0	0	0	0	0	0	0	0	6
05:00	0	20	8	0	9	0	0	0	0	0	0	0	0	37
06:00	0	83	16	1	2	0	0	0	0	0	0	0	0	102
07:00	0	154	23	2	4	0	0	2	0	0	0	0	0	185
08:00	0	187	42	0	4	2	0	1	0	0	0	0	0	236
09:00	1	148	31	0	12	0	0	0	1	0	0	0	0	193
10:00	1	127	29	2	6	2	0	1	1	0	0	0	0	169
11:00	0	144	33	5	7	1	0	0	0	0	0	0	0	190
12 PM	0	158	29	3	5	1	0	0	0	0	0	0	0	196
13:00	1	169	37	0	4	0	0	0	1	0	0	0	0	212
14:00	0	218	40	1	6	1	0	2	1	0	0	0	0	269
15:00	0	322	75	2	9	1	0	0	0	0	0	0	0	409
16:00	2	567	105	2	9	1	0	0	0	0	0	0	0	686
17:00	0	539	84	0	10	0	0	0	0	0	0	0	0	633
18:00	0	324	45	0	4	1	0	1	0	0	0	0	0	375
19:00	1	156	16	0	1	0	0	0	0	0	0	0	0	174
20:00	0	87	15	0	0	0	0	0	0	0	0	0	0	102
21:00	0	62	11	0	2	0	0	0	0	0	0	0	0	75
22:00	0	32	7	0	1	0	0	0	0	0	0	0	0	40
23:00	0	29	7	0	0	0	0	0	0	0	0	0	0	36
Total	6	3544	660	18	95	10	0	7	4	0	0	0	0	4344
Percent	0.1%	81.6%	15.2%	0.4%	2.2%	0.2%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	08:00	08:00	11:00	09:00	08:00		07:00	09:00					08:00
Vol.	1	187	42	5	12	2		2	1					236
PM Peak	16:00	16:00	16:00	12:00	17:00	12:00		14:00	13:00					16:00
Vol.	2	567	105	3	10	1		2	1					686



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	11	2	0	0	0	0	0	0	0	0	0	0	13
01:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
05:00	0	15	8	0	2	0	0	0	0	0	0	0	0	25
06:00	0	76	27	1	1	1	0	0	0	0	0	0	0	106
07:00	1	170	33	1	6	0	0	1	0	0	0	0	0	212
08:00	2	159	46	2	8	1	0	1	0	0	0	0	0	219
09:00	0	135	44	0	7	0	0	0	0	0	0	0	0	186
10:00	0	126	34	1	10	0	0	0	1	0	0	0	0	172
11:00	0	126	35	2	4	0	0	1	0	0	0	0	0	168
12 PM	0	176	32	1	4	0	0	1	0	0	0	0	0	214
13:00	1	163	38	1	2	3	0	0	0	0	0	0	0	208
14:00	1	232	47	2	7	0	0	0	0	0	0	0	0	289
15:00	2	477	86	3	11	1	0	2	0	0	0	0	0	582
16:00	0	502	74	1	14	0	0	0	0	0	0	0	0	591
17:00	2	564	59	1	7	1	0	0	0	0	0	0	0	634
18:00	2	249	31	0	5	0	0	1	0	0	0	0	0	288
19:00	1	101	16	0	1	0	0	0	0	0	0	0	0	119
20:00	0	84	10	0	0	0	0	0	0	0	0	0	0	94
21:00	0	48	5	0	0	0	0	0	0	0	0	0	0	53
22:00	0	56	9	0	1	0	0	0	0	0	0	0	0	66
23:00	0	22	6	0	0	0	0	0	0	0	0	0	0	28
Total	12	3502	644	16	90	7	0	7	1	0	0	0	0	4279
Percent	0.3%	81.8%	15.1%	0.4%	2.1%	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	07:00	08:00	08:00	10:00	06:00		07:00	10:00					08:00
Vol.	2	170	46	2	10	1		1	1					219
PM Peak	15:00	17:00	15:00	15:00	16:00	13:00		15:00						17:00
Vol.	2	564	86	3	14	3		2						634



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WB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/07/1														
8	0	10	3	0	0	0	0	0	0	0	0	0	0	13
01:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	1	0	0	1	0	0	0	0	0	0	0	0	2
05:00	0	4	5	0	1	0	0	0	0	0	0	0	0	10
06:00	0	17	4	0	1	0	0	0	0	0	0	0	0	22
07:00	0	53	19	0	1	0	0	1	0	0	0	0	0	74
08:00	0	85	17	0	5	0	0	1	0	0	0	0	0	108
09:00	0	113	10	0	8	0	0	0	0	0	0	0	0	131
10:00	2	155	18	0	3	1	0	1	0	0	0	0	0	180
11:00	0	177	13	0	3	0	0	0	0	0	0	0	0	193
12 PM	0	193	29	0	5	0	0	0	0	0	0	0	0	227
13:00	0	212	24	0	3	0	0	0	0	0	0	0	0	239
14:00	1	238	26	0	1	1	0	0	0	0	0	0	0	267
15:00	0	213	22	0	2	0	0	1	0	0	0	0	0	238
16:00	0	186	17	0	5	0	0	0	0	0	0	0	0	208
17:00	3	178	18	0	2	0	0	0	0	0	0	0	0	201
18:00	0	152	20	0	0	0	0	1	0	0	0	0	0	173
19:00	0	119	18	0	0	0	0	0	0	0	0	0	0	137
20:00	0	77	9	0	0	0	0	0	0	0	0	0	0	86
21:00	0	57	5	0	0	0	0	0	0	0	0	0	0	62
22:00	0	40	10	0	1	0	0	0	0	0	0	0	0	51
23:00	0	35	2	0	0	0	0	0	0	0	0	0	0	37
Total	6	2322	289	0	42	2	0	5	0	0	0	0	0	2666
Percent	0.2%	87.1%	10.8%	0.0%	1.6%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	07:00		09:00	10:00		07:00						11:00
Vol.	2	177	19		8	1		1						193
PM Peak	17:00	14:00	12:00		12:00	14:00		15:00						14:00
Vol.	3	238	29		5	1		1						267



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west of Old Bedford Road
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Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/08/1														
8	0	12	2	0	0	0	0	0	0	0	0	0	0	14
01:00	0	5	1	0	0	0	0	0	0	0	0	0	0	6
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00	0	9	1	0	0	0	0	0	0	0	0	0	0	10
06:00	0	15	5	0	0	0	0	0	0	0	0	0	0	20
07:00	0	48	6	0	0	0	0	0	0	0	0	0	0	54
08:00	0	72	8	0	1	0	0	0	0	0	0	0	0	81
09:00	2	105	15	0	2	0	0	0	0	0	0	0	0	124
10:00	0	135	8	0	0	0	0	0	0	0	0	0	0	143
11:00	0	187	25	0	2	0	0	0	0	0	0	0	0	214
12 PM	1	176	21	0	2	0	0	0	0	0	0	0	0	200
13:00	0	202	20	0	0	0	0	0	0	0	0	0	0	222
14:00	1	179	15	0	2	0	0	0	0	0	0	0	0	197
15:00	0	148	12	0	3	0	0	0	0	0	0	0	0	163
16:00	0	189	11	0	0	0	0	0	0	0	0	0	0	200
17:00	1	163	16	0	3	0	0	1	0	0	0	0	0	184
18:00	1	121	8	0	1	0	0	0	0	0	0	0	0	131
19:00	0	85	14	0	1	0	0	0	0	0	0	0	0	100
20:00	0	64	3	0	0	0	0	0	0	0	0	0	0	67
21:00	0	26	8	0	0	0	0	0	0	0	0	0	0	34
22:00	0	28	3	0	1	0	0	0	0	0	0	0	0	32
23:00	0	12	1	0	0	0	0	0	0	0	0	0	0	13
Total	6	1986	203	0	18	0	0	1	0	0	0	0	0	2214
Percent	0.3%	89.7%	9.2%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	11:00	11:00		09:00									11:00
Vol.	2	187	25		2									214
PM Peak	12:00	13:00	12:00		15:00			17:00						13:00
Vol.	1	202	21		3			1						222



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176038 E Class
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Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	8	3	0	0	0	0	0	0	0	0	0	0	11
01:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
04:00	0	9	2	0	1	0	0	0	0	0	0	0	0	12
05:00	0	21	9	0	2	2	0	0	1	0	0	0	0	35
06:00	0	84	21	1	0	2	0	1	0	0	0	0	0	109
07:00	1	167	33	1	5	1	0	1	0	0	0	0	0	209
08:00	2	182	34	2	6	3	0	0	0	0	0	0	0	229
09:00	0	143	32	0	15	3	0	1	0	0	0	0	0	194
10:00	0	109	17	0	7	0	0	0	0	0	0	0	0	133
11:00	0	141	23	0	4	0	0	0	0	0	0	0	0	168
12 PM	0	167	27	0	8	0	0	0	1	0	0	0	0	203
13:00	0	158	26	1	4	0	0	0	1	0	0	0	0	190
14:00	0	175	36	2	1	1	0	0	0	0	0	0	0	215
15:00	0	353	67	4	5	1	0	1	0	0	0	0	0	431
16:00	2	492	78	2	12	0	0	0	0	0	0	0	0	586
17:00	2	599	78	2	7	1	0	0	0	0	0	0	0	689
18:00	1	311	33	0	4	1	0	1	0	0	0	0	0	351
19:00	0	137	10	0	1	0	0	0	0	0	0	0	0	148
20:00	0	62	5	0	0	0	0	0	0	0	0	0	0	67
21:00	0	49	5	0	0	0	0	0	0	0	0	0	0	54
22:00	0	31	4	0	0	0	0	0	0	0	0	0	0	35
23:00	0	15	0	0	0	0	0	0	0	0	0	0	0	15
Total	8	3418	546	15	82	15	0	5	3	0	0	0	0	4092
Percent	0.2%	83.5%	13.3%	0.4%	2.0%	0.4%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	08:00	09:00	08:00		06:00	05:00					08:00
Vol.	2	182	34	2	15	3		1	1					229
PM Peak	16:00	17:00	16:00	15:00	16:00	14:00		15:00	12:00					17:00
Vol.	2	599	78	4	12	1		1	1					689



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Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	5	1	0	0	1	0	0	0	0	0	0	0	7
05:00	0	26	9	0	4	0	0	0	0	0	0	0	0	39
06:00	0	77	24	0	3	1	0	1	0	0	0	0	0	106
07:00	0	157	27	3	2	0	0	0	1	0	0	0	0	190
08:00	1	183	44	1	7	1	0	2	1	0	0	0	0	240
09:00	1	177	31	1	8	1	1	1	0	0	0	0	0	221
10:00	0	127	29	2	7	0	0	2	0	0	0	0	0	167
11:00	0	143	29	1	7	0	0	0	0	0	0	0	0	180
12 PM	0	159	29	5	8	1	0	0	0	0	0	0	0	202
13:00	0	156	30	1	12	0	0	0	0	0	0	0	0	199
14:00	0	213	37	0	4	1	0	0	2	0	0	0	0	257
15:00	0	376	73	1	6	3	0	0	0	0	0	0	0	459
16:00	1	586	78	0	8	1	0	0	0	0	0	0	0	674
17:00	1	574	57	0	13	1	0	0	0	0	0	0	0	646
18:00	1	305	24	1	2	0	0	1	0	0	0	0	0	334
19:00	0	143	12	0	0	0	0	0	0	0	0	0	0	155
20:00	0	74	10	0	0	1	0	0	0	0	0	0	0	85
21:00	0	67	6	0	0	0	0	0	0	0	0	0	0	73
22:00	0	38	6	0	0	0	0	0	0	0	0	0	0	44
23:00	0	20	1	0	0	0	0	0	0	0	0	0	0	21
Total	5	3615	557	16	91	12	1	7	4	0	0	0	0	4308
Percent	0.1%	83.9%	12.9%	0.4%	2.1%	0.3%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	08:00	07:00	09:00	04:00	09:00	08:00	07:00					08:00
Vol.	1	183	44	3	8	1	1	2	1					240
PM Peak	16:00	16:00	16:00	12:00	17:00	15:00		18:00	14:00					16:00
Vol.	1	586	78	5	13	3		1	2					674



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Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	6	1	0	0	0	0	0	0	0	0	0	0	7
01:00	0	4	0	0	0	0	0	0	0	0	0	0	0	4
02:00	0	1	0	0	0	0	0	0	1	0	0	0	0	2
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	7	3	0	0	0	0	0	0	0	0	0	0	10
05:00	0	21	10	0	5	0	0	0	0	0	0	0	0	36
06:00	0	84	23	0	2	0	0	1	0	0	0	0	0	110
07:00	0	171	41	2	6	2	0	1	0	0	0	0	0	223
08:00	1	229	34	2	10	1	0	1	2	0	0	0	0	280
09:00	1	172	37	3	10	1	0	3	0	0	0	0	0	227
10:00	0	133	25	1	9	1	0	1	2	0	0	0	0	172
11:00	0	159	42	0	8	0	0	0	0	0	0	0	0	209
12 PM	0	162	26	2	5	0	0	1	0	0	0	0	0	196
13:00	0	173	35	2	8	0	0	0	1	0	0	0	0	219
14:00	1	217	43	3	6	2	0	1	0	0	0	0	0	273
15:00	3	377	78	4	5	1	0	0	0	0	0	0	0	468
16:00	3	507	63	2	11	1	0	0	0	0	0	0	0	587
17:00	1	563	59	0	7	0	0	0	0	0	0	0	0	630
18:00	2	302	28	0	4	1	0	1	0	0	0	0	0	338
19:00	0	135	14	0	1	0	0	0	0	0	0	0	0	150
20:00	0	124	15	0	1	0	0	0	0	0	0	0	0	140
21:00	0	98	12	0	1	0	0	0	0	0	0	0	0	111
22:00	0	34	6	0	1	0	0	0	0	0	0	0	0	41
23:00	1	20	2	0	0	0	0	0	0	0	0	0	0	23
Total	13	3701	597	21	100	10	0	10	6	0	0	0	0	4458
Percent	0.3%	83.0%	13.4%	0.5%	2.2%	0.2%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	08:00	08:00	11:00	09:00	08:00	07:00		09:00	08:00					08:00
Vol.	1	229	42	3	10	2		3	2					280
PM Peak	15:00	17:00	15:00	15:00	16:00	14:00		12:00	13:00					17:00
Vol.	3	563	78	4	11	2		1	1					630



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	0	3	0	2	0	0	0	0	0	0	5	42	36
01:00	0	0	1	1	1	0	0	0	0	0	0	0	0	3	31	27
02:00	0	0	0	0	1	2	1	0	0	0	0	0	0	4	41	37
03:00	0	0	0	1	0	3	1	1	0	0	0	0	0	6	44	38
04:00	0	0	0	0	1	6	4	3	0	0	0	0	0	14	45	40
05:00	0	0	0	1	13	27	18	0	1	0	0	0	0	60	41	38
06:00	0	1	1	18	76	67	11	6	0	0	0	0	0	180	38	34
07:00	0	0	8	55	143	132	19	1	0	0	0	0	0	358	37	33
08:00	3	2	9	44	172	135	20	2	0	0	0	0	0	387	37	33
09:00	0	0	3	36	114	103	16	0	0	0	0	0	0	272	37	34
10:00	0	1	0	19	83	79	8	2	0	0	0	0	0	192	37	34
11:00	0	1	2	11	78	63	12	0	0	0	0	0	0	167	37	34
12 PM	0	1	4	15	83	69	14	0	0	0	0	0	0	186	37	34
13:00	0	0	2	7	61	83	16	2	0	0	0	0	0	171	38	35
14:00	0	0	0	9	82	77	9	0	0	0	0	0	0	177	37	34
15:00	0	0	4	25	95	71	12	0	0	0	0	0	0	207	37	33
16:00	0	0	3	15	78	82	9	1	0	0	0	0	0	188	37	34
17:00	0	0	1	20	74	88	16	1	0	0	0	0	0	200	38	35
18:00	0	2	5	12	61	54	13	0	0	0	0	0	0	147	38	34
19:00	0	0	0	10	55	41	10	1	0	0	0	0	0	117	38	34
20:00	0	0	0	8	34	20	4	0	0	0	0	0	0	66	37	34
21:00	0	0	1	11	31	36	8	0	0	0	0	0	0	87	38	34
22:00	0	0	0	3	16	18	2	2	0	0	0	0	0	41	38	35
23:00	0	0	0	4	9	9	3	0	0	0	0	0	0	25	38	34
Total	3	8	44	325	1364	1265	228	22	1	0	0	0	0	3260		
%	0.1%	0.2%	1.3%	10.0%	41.8%	38.8%	7.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	07:00	08:00	08:00	08:00	06:00	05:00					08:00		
Vol.	3	2	9	55	172	135	20	6	1					387		
PM Peak		18:00	18:00	15:00	15:00	17:00	13:00	13:00						15:00		
Vol.		2	5	25	95	88	16	2						207		

Stats

15th Percentile :	29 MPH
50th Percentile :	33 MPH
85th Percentile :	38 MPH
95th Percentile :	40 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	2629
Percent in Pace :	80.6%
Number of Vehicles > 35 MPH :	1263
Percent of Vehicles > 35 MPH :	38.7%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	1	1	2	2	0	0	0	0	0	0	6	41	36
01:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
02:00	0	0	0	1	2	1	0	0	0	0	0	0	0	4	36	32
03:00	0	0	0	0	1	3	0	0	0	0	0	0	0	4	38	36
04:00	0	0	0	0	0	4	2	1	0	0	0	0	0	7	43	40
05:00	0	0	0	4	19	16	10	3	0	0	0	0	0	52	41	36
06:00	0	0	0	13	47	82	18	1	0	0	0	0	0	161	38	35
07:00	0	0	7	31	151	140	17	1	0	0	0	0	0	347	37	34
08:00	0	0	2	44	156	120	19	1	0	0	0	0	0	342	37	34
09:00	0	2	2	34	133	91	10	1	0	0	0	0	0	273	37	33
10:00	1	2	4	13	75	68	17	0	0	0	0	0	0	180	38	34
11:00	0	0	2	14	92	79	8	2	0	0	0	0	0	197	37	34
12 PM	0	0	0	21	75	85	7	0	0	0	0	0	0	188	37	34
13:00	0	0	5	19	78	60	13	0	0	0	0	0	0	175	37	34
14:00	0	0	12	21	74	58	19	2	0	0	0	0	0	186	38	34
15:00	0	3	9	42	119	35	5	1	0	0	0	0	0	214	35	32
16:00	0	2	5	28	100	40	6	0	0	1	0	0	0	182	36	32
17:00	0	0	0	28	82	65	9	2	0	0	0	0	0	186	37	34
18:00	0	2	2	26	58	59	10	0	0	0	0	0	0	157	37	33
19:00	0	0	1	16	38	40	4	0	0	0	0	0	0	99	37	34
20:00	0	0	1	13	26	23	4	0	0	0	0	0	0	67	37	33
21:00	0	0	1	6	35	15	3	0	0	0	0	0	0	60	36	33
22:00	0	0	0	2	12	14	1	1	0	0	0	0	0	30	38	35
23:00	0	0	0	2	7	22	2	0	0	0	0	0	0	33	38	36
Total	1	11	53	379	1382	1122	186	16	0	1	0	0	0	3151		
%	0.0%	0.3%	1.7%	12.0%	43.9%	35.6%	5.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	09:00	07:00	08:00	08:00	07:00	08:00	05:00						07:00		
Vol.	1	2	7	44	156	140	19	3						347		
PM Peak		15:00	14:00	15:00	15:00	12:00	14:00	14:00		16:00				15:00		
Vol.		3	12	42	119	85	19	2		1				214		

Stats

15th Percentile : 29 MPH
50th Percentile : 33 MPH
85th Percentile : 37 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 34 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 2504
Percent in Pace : 79.5%
Number of Vehicles > 35 MPH : 1101
Percent of Vehicles > 35 MPH : 34.9%



PRECISION
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INDUSTRIES, LLC

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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/																
18	0	0	0	0	2	5	3	0	0	0	0	0	0	10	41	37
01:00	0	0	0	1	1	1	0	0	0	0	0	0	0	3	36	32
02:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
03:00	0	0	0	0	2	0	0	0	0	0	0	0	0	2	33	32
04:00	0	0	0	1	1	1	2	0	0	0	0	0	0	5	42	36
05:00	0	0	0	0	2	2	2	0	0	0	0	0	0	6	41	37
06:00	0	0	1	9	10	11	2	1	0	0	0	0	0	34	38	33
07:00	0	0	1	8	25	23	3	1	0	0	0	0	0	61	37	34
08:00	0	0	1	20	40	37	11	0	0	0	0	0	0	109	38	34
09:00	0	1	2	21	88	70	8	0	0	0	0	0	0	190	37	34
10:00	0	1	2	20	76	61	15	0	0	0	0	0	0	175	38	34
11:00	0	2	0	19	78	79	9	0	0	0	0	0	0	187	37	34
12 PM	0	2	3	36	83	76	12	1	0	0	0	0	0	213	37	33
13:00	0	2	4	26	118	78	12	0	0	0	0	0	0	240	37	33
14:00	0	0	4	18	96	62	12	1	0	0	0	0	0	193	37	34
15:00	0	1	3	17	61	88	9	2	0	0	0	0	0	181	38	34
16:00	0	0	7	18	61	79	21	1	0	0	0	0	0	187	38	34
17:00	0	4	9	10	63	54	12	1	0	0	0	0	0	153	38	33
18:00	0	0	4	18	46	57	11	2	0	0	0	0	0	138	38	34
19:00	0	1	2	14	46	29	6	0	0	0	0	0	0	98	37	33
20:00	1	0	0	3	24	40	8	0	0	0	0	0	0	76	38	35
21:00	0	0	1	8	32	15	4	0	1	0	0	0	0	61	37	33
22:00	0	0	2	4	18	21	8	1	0	0	0	0	0	54	39	35
23:00	0	0	0	1	13	16	4	2	0	0	0	0	0	36	39	36
Total	1	14	46	272	987	906	174	13	1	0	0	0	0	2414		
%	0.0%	0.6%	1.9%	11.3%	40.9%	37.5%	7.2%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		11:00	09:00	09:00	09:00	11:00	10:00	06:00						09:00		
Vol.		2	2	21	88	79	15	1						190		
PM Peak	20:00	17:00	17:00	12:00	13:00	15:00	16:00	15:00	21:00					13:00		
Vol.	1	4	9	36	118	88	21	2	1					240		

Stats

15th Percentile :	29 MPH
50th Percentile :	33 MPH
85th Percentile :	38 MPH
95th Percentile :	40 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	1893
Percent in Pace :	78.4%
Number of Vehicles > 35 MPH :	913
Percent of Vehicles > 35 MPH :	37.8%



PRECISION
D A T A
INDUSTRIES, LLC

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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	4	4	2	0	0	0	0	0	0	10	40	36
01:00	0	0	0	0	4	1	1	0	0	0	0	0	0	6	39	34
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
03:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3	37	35
04:00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	43	42
05:00	0	0	0	1	0	1	1	0	0	0	0	0	0	3	41	35
06:00	0	0	2	0	8	12	6	1	0	0	0	0	0	29	41	36
07:00	0	0	0	4	14	20	7	3	0	0	0	0	0	48	40	36
08:00	0	0	2	9	27	45	9	1	0	0	0	0	0	93	38	35
09:00	0	0	2	11	57	60	13	2	0	0	0	0	0	145	38	35
10:00	0	1	4	17	48	52	8	1	1	0	0	0	0	132	38	34
11:00	0	5	5	19	83	63	10	1	0	0	0	0	0	186	37	33
12 PM	0	0	2	24	91	64	9	1	0	0	0	0	0	191	37	33
13:00	0	1	3	26	105	69	11	0	0	0	0	0	0	215	37	33
14:00	0	2	1	20	65	56	13	0	0	0	0	0	0	157	38	34
15:00	0	2	6	11	72	81	13	0	0	0	0	0	0	185	38	34
16:00	0	0	2	12	45	63	10	1	0	0	0	0	0	133	38	35
17:00	0	0	2	10	67	56	12	1	0	0	0	0	0	148	38	34
18:00	0	0	0	10	33	51	16	0	0	0	0	0	0	110	38	35
19:00	0	0	2	8	29	37	8	0	0	0	0	0	0	84	38	34
20:00	0	0	0	3	15	23	4	2	0	0	0	0	0	47	38	36
21:00	0	0	1	1	6	13	6	1	0	0	0	0	0	28	41	36
22:00	0	0	0	1	3	7	1	0	0	0	0	0	0	12	38	35
23:00	0	0	0	0	1	5	3	0	1	0	0	0	0	10	43	40
Total %	0 0.0%	11 0.6%	34 1.7%	187 9.5%	778 39.4%	786 39.8%	164 8.3%	15 0.8%	2 0.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1977		
AM Peak		11:00	11:00	11:00	11:00	11:00	09:00	07:00	10:00					11:00		
Vol.		5	5	19	83	63	13	3	1					186		
PM Peak		14:00	15:00	13:00	13:00	15:00	18:00	20:00	23:00					13:00		
Vol.		2	6	26	105	81	16	2	1					215		

Stats

15th Percentile :	29 MPH
50th Percentile :	33 MPH
85th Percentile :	38 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	1564
Percent in Pace :	79.1%
Number of Vehicles > 35 MPH :	810
Percent of Vehicles > 35 MPH :	41.0%



PRECISION
D A T A
INDUSTRIES, LLC

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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	0	1	0	0	0	0	0	0	0	0	1	33	32
01:00	0	0	0	0	0	2	0	0	0	0	0	0	0	2	38	37
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
03:00	2	0	1	0	2	1	0	0	0	0	0	0	0	6	34	23
04:00	0	0	0	0	0	3	2	3	0	0	0	0	0	8	47	42
05:00	0	0	0	3	13	30	16	2	1	0	0	0	0	65	41	37
06:00	0	0	1	18	63	77	22	1	0	0	0	0	0	182	38	35
07:00	0	0	1	44	134	154	34	3	0	0	0	0	0	370	38	35
08:00	0	3	14	50	153	141	20	1	0	0	0	0	0	382	37	33
09:00	0	0	6	13	117	92	16	0	0	0	0	0	0	244	37	34
10:00	0	1	7	26	91	66	10	0	0	0	0	0	0	201	37	33
11:00	0	0	0	9	65	55	9	0	0	0	0	0	0	138	37	34
12 PM	0	0	1	9	60	82	14	0	0	0	0	0	0	166	38	35
13:00	0	0	0	12	62	69	9	0	0	0	0	0	0	152	38	34
14:00	0	0	2	25	74	53	6	1	0	0	0	0	0	161	37	33
15:00	0	0	2	17	99	67	14	2	0	0	0	0	0	201	37	34
16:00	0	0	1	25	65	70	15	1	0	0	0	0	0	177	38	34
17:00	0	0	2	23	90	79	11	2	0	0	0	0	0	207	37	34
18:00	0	2	4	13	65	76	6	0	0	0	0	0	0	166	37	34
19:00	0	0	1	16	31	52	8	1	0	0	0	0	0	109	38	34
20:00	0	0	0	5	17	28	10	0	0	0	0	0	0	60	39	36
21:00	0	0	0	2	14	25	6	0	0	0	0	0	0	47	38	36
22:00	0	0	0	0	9	13	2	0	1	0	0	0	0	25	38	36
23:00	0	0	1	1	2	5	2	0	0	0	0	0	0	11	39	35
Total %	2 0.1%	6 0.2%	44 1.4%	311 10.1%	1227 39.8%	1241 40.3%	232 7.5%	17 0.6%	2 0.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	3082		
AM Peak	03:00	08:00	08:00	08:00	08:00	07:00	07:00	04:00	05:00					08:00		
Vol.	2	3	14	50	153	154	34	3	1					382		
PM Peak		18:00	18:00	14:00	15:00	12:00	16:00	15:00	22:00					17:00		
Vol.		2	4	25	99	82	15	2	1					207		

Stats

15th Percentile :	29 MPH
50th Percentile :	33 MPH
85th Percentile :	38 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	2468
Percent in Pace :	80.1%
Number of Vehicles > 35 MPH :	1244
Percent of Vehicles > 35 MPH :	40.4%



PRECISION
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#737 Route 62
west of Old Bedford Road
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Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
01:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
02:00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	43	42
03:00	0	0	0	3	0	1	1	0	0	0	0	0	0	5	40	32
04:00	0	0	0	0	5	3	4	3	0	0	0	0	0	15	45	39
05:00	0	0	0	4	21	27	10	3	0	1	0	0	0	66	41	36
06:00	1	0	6	12	54	73	18	1	0	0	0	0	0	165	38	35
07:00	0	3	13	71	154	122	15	1	1	0	0	0	0	380	37	33
08:00	7	3	9	32	133	159	18	1	0	0	0	0	0	362	37	33
09:00	0	2	8	30	65	104	18	1	0	0	0	0	0	228	38	34
10:00	0	0	0	10	80	96	12	0	0	0	0	0	0	198	38	35
11:00	0	0	4	23	61	61	11	0	0	0	0	0	0	160	37	34
12 PM	0	1	3	34	75	74	15	0	0	0	0	0	0	202	37	34
13:00	0	1	3	22	86	48	5	0	0	0	0	0	0	165	36	33
14:00	0	0	2	20	66	75	6	2	0	0	0	0	0	171	37	34
15:00	0	0	3	30	102	68	9	0	0	0	0	0	0	212	37	33
16:00	0	0	2	21	79	83	11	0	0	0	0	0	0	196	37	34
17:00	1	0	1	20	94	74	17	0	0	0	0	0	0	207	38	34
18:00	0	0	0	13	52	88	9	1	0	0	0	0	0	163	38	35
19:00	0	0	0	7	43	37	17	0	0	0	0	0	0	104	39	35
20:00	0	0	0	10	22	37	5	0	0	0	0	0	0	74	38	35
21:00	0	0	0	3	16	24	7	0	0	0	0	0	0	50	38	35
22:00	0	0	0	3	6	15	2	1	0	0	0	0	0	27	38	36
23:00	0	0	0	1	7	4	4	1	0	0	0	0	0	17	42	36
Total %	9 0.3%	10 0.3%	54 1.7%	369 11.6%	1223 38.6%	1275 40.2%	215 6.8%	15 0.5%	1 0.0%	1 0.0%	0 0.0%	0 0.0%	0 0.0%	3172		
AM Peak	08:00	07:00	07:00	07:00	07:00	08:00	06:00	04:00	07:00	05:00				07:00		
Vol.	7	3	13	71	154	159	18	3	1	1				380		
PM Peak	17:00	12:00	12:00	12:00	15:00	18:00	17:00	14:00						15:00		
Vol.	1	1	3	34	102	88	17	2						212		

Stats

15th Percentile :	29 MPH
50th Percentile :	33 MPH
85th Percentile :	38 MPH
95th Percentile :	40 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	2498
Percent in Pace :	78.8%
Number of Vehicles > 35 MPH :	1252
Percent of Vehicles > 35 MPH :	39.5%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
EB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	0	1	2	0	1	0	0	0	0	0	4	46	38
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	1	0	1	0	0	0	0	0	0	2	42	37
03:00	0	0	0	0	2	3	1	0	0	0	0	0	0	6	39	36
04:00	0	0	0	0	0	9	5	1	0	0	0	0	0	15	42	39
05:00	0	0	1	1	14	30	7	6	0	0	0	0	0	59	41	37
06:00	0	0	0	15	53	85	18	2	0	0	0	0	0	173	38	35
07:00	0	0	10	56	121	172	26	0	0	0	0	0	0	385	38	34
08:00	0	0	5	41	155	149	19	1	0	0	0	0	0	370	37	34
09:00	0	1	5	18	112	118	27	1	0	0	0	0	0	282	38	35
10:00	0	1	8	28	80	65	14	0	0	0	0	0	0	196	37	33
11:00	0	1	2	13	72	62	11	1	0	0	0	0	0	162	38	34
12 PM	0	0	5	25	73	84	15	0	0	0	0	0	0	202	38	34
13:00	0	0	1	25	67	67	13	2	0	0	0	0	0	175	38	34
14:00	0	2	3	35	73	55	10	1	0	0	0	0	0	179	37	33
15:00	0	0	7	38	88	86	15	0	0	0	0	0	0	234	37	33
16:00	0	0	3	23	94	99	10	0	0	0	0	0	0	229	37	34
17:00	0	1	2	15	86	88	15	1	0	0	0	0	0	208	38	34
18:00	0	1	4	11	73	70	12	1	0	0	0	0	0	172	38	34
19:00	0	0	2	12	51	47	8	4	0	0	0	0	0	124	38	34
20:00	0	0	1	16	29	25	14	1	0	0	0	0	0	86	39	34
21:00	0	0	2	6	22	26	5	3	0	0	0	0	0	64	38	35
22:00	0	0	0	0	5	14	4	1	0	0	0	0	0	24	40	37
23:00	0	0	0	4	6	12	2	0	0	0	0	0	0	24	38	35
Total	0	7	61	382	1278	1368	252	27	0	0	0	0	0	3375		
%	0.0%	0.2%	1.8%	11.3%	37.9%	40.5%	7.5%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		09:00	07:00	07:00	08:00	07:00	09:00	05:00						07:00		
Vol.		1	10	56	155	172	27	6						385		
PM Peak		14:00	15:00	15:00	16:00	16:00	12:00	19:00						15:00		
Vol.		2	7	38	94	99	15	4						234		

Stats

15th Percentile :	29 MPH
50th Percentile :	33 MPH
85th Percentile :	38 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	2646
Percent in Pace :	78.4%
Number of Vehicles > 35 MPH :	1373
Percent of Vehicles > 35 MPH :	40.7%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	3	0	3	2	1	0	0	0	0	0	9	43	36
01:00	0	0	1	1	1	1	1	0	0	0	0	0	0	5	40	32
02:00	0	0	0	0	1	2	1	0	0	0	0	0	0	4	41	37
03:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
04:00	0	0	0	1	0	2	1	2	0	0	0	0	0	6	46	39
05:00	0	0	0	0	16	16	4	1	0	0	0	0	0	37	38	36
06:00	0	0	1	2	24	66	8	1	0	0	0	0	0	102	38	36
07:00	0	0	2	18	74	85	6	0	0	0	0	0	0	185	37	34
08:00	2	2	3	25	108	90	6	0	0	0	0	0	0	236	37	33
09:00	0	1	3	22	65	85	17	0	0	0	0	0	0	193	38	34
10:00	0	0	0	16	51	80	22	0	0	0	0	0	0	169	38	35
11:00	0	1	3	14	63	93	15	1	0	0	0	0	0	190	38	35
12 PM	0	1	3	19	66	92	13	2	0	0	0	0	0	196	38	34
13:00	0	0	2	15	74	98	20	3	0	0	0	0	0	212	38	35
14:00	0	0	2	18	99	125	25	0	0	0	0	0	0	269	38	35
15:00	0	0	2	71	191	128	16	1	0	0	0	0	0	409	37	33
16:00	0	0	10	162	335	157	21	1	0	0	0	0	0	686	36	32
17:00	0	1	5	141	309	164	12	1	0	0	0	0	0	633	36	32
18:00	0	0	4	61	165	132	13	0	0	0	0	0	0	375	37	33
19:00	0	0	2	19	50	86	17	0	0	0	0	0	0	174	38	35
20:00	0	0	0	9	27	57	9	0	0	0	0	0	0	102	38	35
21:00	0	1	1	6	32	30	5	0	0	0	0	0	0	75	37	34
22:00	0	0	0	3	12	20	4	1	0	0	0	0	0	40	38	36
23:00	0	0	0	2	7	19	7	1	0	0	0	0	0	36	40	37
Total	2	7	44	628	1770	1632	245	16	0	0	0	0	0	4344		
%	0.0%	0.2%	1.0%	14.5%	40.7%	37.6%	5.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	08:00	08:00	11:00	10:00	04:00						08:00		
Vol.	2	2	3	25	108	93	22	2						236		
PM Peak		12:00	16:00	16:00	16:00	17:00	14:00	13:00						16:00		
Vol.		1	10	162	335	164	25	3						686		

Stats

15th Percentile :	28 MPH
50th Percentile :	33 MPH
85th Percentile :	37 MPH
95th Percentile :	39 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	3402
Percent in Pace :	78.3%
Number of Vehicles > 35 MPH :	1567
Percent of Vehicles > 35 MPH :	36.1%



PRECISION
D A T A
INDUSTRIES, LLC

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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	2	1	9	1	0	0	0	0	0	0	13	38	35
01:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3	37	35
02:00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	43	42
03:00	0	0	0	0	0	2	1	0	0	0	0	0	0	3	41	39
04:00	0	0	0	1	1	1	0	1	1	0	0	0	0	5	50	39
05:00	0	0	0	0	4	14	6	1	0	0	0	0	0	25	41	38
06:00	0	0	1	3	24	65	13	0	0	0	0	0	0	106	38	36
07:00	0	0	0	19	84	95	14	0	0	0	0	0	0	212	38	34
08:00	0	1	3	30	70	105	9	1	0	0	0	0	0	219	37	34
09:00	0	0	4	14	69	85	12	2	0	0	0	0	0	186	38	35
10:00	1	0	1	13	60	84	12	1	0	0	0	0	0	172	38	35
11:00	0	0	1	17	52	88	10	0	0	0	0	0	0	168	38	35
12 PM	0	0	3	24	68	105	13	0	1	0	0	0	0	214	38	34
13:00	0	2	3	20	82	90	11	0	0	0	0	0	0	208	37	34
14:00	0	0	8	41	137	92	11	0	0	0	0	0	0	289	37	33
15:00	1	0	7	149	296	123	6	0	0	0	0	0	0	582	35	32
16:00	0	0	6	146	268	154	15	2	0	0	0	0	0	591	36	32
17:00	0	2	11	123	319	165	13	1	0	0	0	0	0	634	36	32
18:00	0	1	4	45	106	109	21	2	0	0	0	0	0	288	38	34
19:00	0	0	0	14	48	47	10	0	0	0	0	0	0	119	38	34
20:00	0	1	2	10	25	47	7	2	0	0	0	0	0	94	38	35
21:00	1	0	0	3	22	25	2	0	0	0	0	0	0	53	37	34
22:00	0	0	3	12	25	22	4	0	0	0	0	0	0	66	37	33
23:00	0	0	1	5	3	18	1	0	0	0	0	0	0	28	38	34
Total	3	7	58	691	1765	1547	193	13	2	0	0	0	0	4279		
%	0.1%	0.2%	1.4%	16.1%	41.2%	36.2%	4.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	08:00	09:00	08:00	07:00	08:00	07:00	09:00	04:00					08:00		
Vol.	1	1	4	30	84	105	14	2	1					219		
PM Peak	15:00	13:00	17:00	15:00	17:00	17:00	18:00	16:00	12:00					17:00		
Vol.	1	2	11	149	319	165	21	2	1					634		

Stats

15th Percentile :	28 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	38 MPH
Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	3312
Percent in Pace :	77.4%
Number of Vehicles > 35 MPH :	1446
Percent of Vehicles > 35 MPH :	33.8%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/ 18	0	0	0	2	4	6	1	0	0	0	0	0	0	13	38	34
01:00	0	0	0	1	0	1	0	0	0	0	0	0	0	2	37	32
02:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
03:00	0	0	0	0	1	1	1	0	0	0	0	0	0	3	41	37
04:00	0	0	1	0	0	0	1	0	0	0	0	0	0	2	42	32
05:00	0	0	0	1	3	3	0	0	0	0	0	0	0	10	41	36
06:00	0	0	0	1	7	13	1	0	0	0	0	0	0	22	38	35
07:00	0	0	3	7	16	36	11	1	0	0	0	0	0	74	39	35
08:00	0	0	2	10	29	54	10	3	0	0	0	0	0	108	38	35
09:00	0	0	4	17	41	59	9	1	0	0	0	0	0	131	38	34
10:00	0	0	5	15	56	87	15	2	0	0	0	0	0	180	38	35
11:00	0	0	2	23	65	91	12	0	0	0	0	0	0	193	38	34
12 PM	0	0	3	17	85	108	14	0	0	0	0	0	0	227	38	34
13:00	0	0	6	38	99	86	10	0	0	0	0	0	0	239	37	33
14:00	0	0	3	40	106	107	11	0	0	0	0	0	0	267	37	34
15:00	0	1	9	26	93	93	16	0	0	0	0	0	0	238	37	34
16:00	0	1	5	20	77	88	16	1	0	0	0	0	0	208	38	34
17:00	0	0	4	22	65	80	30	0	0	0	0	0	0	201	38	35
18:00	0	0	1	19	55	78	19	1	0	0	0	0	0	173	38	35
19:00	1	1	0	10	43	72	10	0	0	0	0	0	0	137	38	35
20:00	0	1	0	7	32	38	8	0	0	0	0	0	0	86	38	35
21:00	0	0	2	5	25	27	3	0	0	0	0	0	0	62	37	34
22:00	0	1	1	4	15	26	4	0	0	0	0	0	0	51	38	34
23:00	0	0	1	6	13	13	3	1	0	0	0	0	0	37	38	34
Total	1	5	52	291	931	1168	208	10	0	0	0	0	0	2666		
%	0.0%	0.2%	2.0%	10.9%	34.9%	43.8%	7.8%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak			10:00	11:00	11:00	11:00	10:00	08:00						11:00		
Vol.			5	23	65	91	15	3						193		
PM Peak	19:00	15:00	15:00	14:00	14:00	12:00	17:00	16:00						14:00		
Vol.	1	1	9	40	106	108	30	1						267		

Stats

15th Percentile :	29 MPH
50th Percentile :	34 MPH
85th Percentile :	38 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	2099
Percent in Pace :	78.7%
Number of Vehicles > 35 MPH :	1152
Percent of Vehicles > 35 MPH :	43.2%



PRECISION
D A T A
INDUSTRIES, LLC

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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/18	0	0	1	1	5	4	3	0	0	0	0	0	0	14	40	34
01:00	0	0	1	1	2	1	1	0	0	0	0	0	0	6	39	32
02:00	0	0	0	1	0	1	0	0	0	0	0	0	0	2	37	32
03:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
04:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
05:00	0	0	2	3	3	0	0	2	0	0	0	0	0	10	45	32
06:00	0	0	0	1	3	9	5	2	0	0	0	0	0	20	42	38
07:00	0	0	2	3	7	31	8	3	0	0	0	0	0	54	40	37
08:00	0	0	0	7	16	32	24	2	0	0	0	0	0	81	41	37
09:00	0	1	2	12	37	57	14	1	0	0	0	0	0	124	38	35
10:00	0	1	4	13	58	58	7	2	0	0	0	0	0	143	37	34
11:00	0	0	3	27	87	80	17	0	0	0	0	0	0	214	38	34
12 PM	0	0	1	25	88	77	8	1	0	0	0	0	0	200	37	34
13:00	0	1	5	22	81	94	16	3	0	0	0	0	0	222	38	34
14:00	0	0	9	26	82	76	4	0	0	0	0	0	0	197	37	33
15:00	0	0	3	18	48	78	16	0	0	0	0	0	0	163	38	35
16:00	0	0	2	25	85	78	10	0	0	0	0	0	0	200	37	34
17:00	0	0	5	24	64	77	14	0	0	0	0	0	0	184	38	34
18:00	0	0	1	12	48	57	12	1	0	0	0	0	0	131	38	35
19:00	1	0	1	12	29	45	12	0	0	0	0	0	0	100	38	35
20:00	0	0	2	7	19	32	7	0	0	0	0	0	0	67	38	35
21:00	0	0	0	4	12	12	6	0	0	0	0	0	0	34	39	35
22:00	0	1	0	0	7	18	5	1	0	0	0	0	0	32	40	36
23:00	0	0	0	1	2	5	4	1	0	0	0	0	0	13	42	38
Total %	1 0.0%	4 0.2%	44 2.0%	246 11.1%	784 35.4%	923 41.7%	193 8.7%	19 0.9%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2214		
AM Peak		09:00	10:00	11:00	11:00	11:00	08:00	07:00						11:00		
Vol.		1	4	27	87	80	24	3						214		
PM Peak	19:00	13:00	14:00	14:00	12:00	13:00	13:00	13:00						13:00		
Vol.	1	1	9	26	88	94	16	3						222		

Stats

15th Percentile :	29 MPH
50th Percentile :	34 MPH
85th Percentile :	38 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	1707
Percent in Pace :	77.1%
Number of Vehicles > 35 MPH :	950
Percent of Vehicles > 35 MPH :	42.9%



PRECISION
D A T A
INDUSTRIES, LLC

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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	1	2	5	3	0	0	0	0	0	0	11	41	37
01:00	0	0	0	1	0	2	0	0	0	0	0	0	0	3	37	34
02:00	0	0	0	0	0	0	2	0	0	0	0	0	0	2	43	42
03:00	0	0	0	0	2	0	1	0	0	0	0	0	0	3	41	35
04:00	0	0	0	1	1	4	3	1	2	0	0	0	0	12	49	40
05:00	0	0	0	2	12	18	3	0	0	0	0	0	0	35	38	35
06:00	0	0	0	4	40	59	5	1	0	0	0	0	0	109	38	35
07:00	0	0	1	22	102	76	8	0	0	0	0	0	0	209	37	34
08:00	2	0	5	26	98	90	8	0	0	0	0	0	0	229	37	33
09:00	0	1	1	12	82	81	16	1	0	0	0	0	0	194	38	35
10:00	0	0	3	11	44	68	7	0	0	0	0	0	0	133	38	34
11:00	0	0	4	16	53	83	12	0	0	0	0	0	0	168	38	34
12 PM	0	0	1	17	81	89	13	2	0	0	0	0	0	203	38	35
13:00	0	1	1	16	64	94	13	1	0	0	0	0	0	190	38	35
14:00	0	0	3	26	76	96	14	0	0	0	0	0	0	215	38	34
15:00	0	0	4	80	204	135	8	0	0	0	0	0	0	431	36	33
16:00	0	0	3	143	297	131	12	0	0	0	0	0	0	586	36	32
17:00	0	0	18	220	311	127	13	0	0	0	0	0	0	689	35	31
18:00	1	0	12	52	129	138	18	1	0	0	0	0	0	351	37	33
19:00	0	0	2	17	47	72	10	0	0	0	0	0	0	148	38	34
20:00	0	0	1	8	21	31	5	1	0	0	0	0	0	67	38	35
21:00	0	0	1	5	18	26	3	1	0	0	0	0	0	54	38	35
22:00	0	0	1	2	8	17	6	1	0	0	0	0	0	35	40	36
23:00	0	1	0	2	5	5	2	0	0	0	0	0	0	15	38	33
Total	3	3	61	684	1697	1447	185	10	2	0	0	0	0	4092		
%	0.1%	0.1%	1.5%	16.7%	41.5%	35.4%	4.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	08:00	08:00	07:00	08:00	09:00	04:00	04:00					08:00		
Vol.	2	1	5	26	102	90	16	1	2					229		
PM Peak	18:00	13:00	17:00	17:00	17:00	18:00	18:00	12:00						17:00		
Vol.	1	1	18	220	311	138	18	2						689		

Stats

15th Percentile :	27 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	38 MPH
Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	3144
Percent in Pace :	76.8%
Number of Vehicles > 35 MPH :	1355
Percent of Vehicles > 35 MPH :	33.1%



PRECISION
D A T A
INDUSTRIES, LLC

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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
WB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	2	0	1	0	0	0	0	0	0	0	3	36	30
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
02:00	0	0	0	0	0	1	1	0	0	0	0	0	0	2	42	40
03:00	0	0	0	0	1	2	0	0	0	0	0	0	0	3	37	35
04:00	0	0	0	1	2	2	0	2	0	0	0	0	0	7	46	37
05:00	0	0	0	4	8	23	3	1	0	0	0	0	0	39	38	36
06:00	0	0	0	2	24	64	15	1	0	0	0	0	0	106	39	36
07:00	0	0	2	19	99	61	9	0	0	0	0	0	0	190	37	33
08:00	0	1	2	38	123	72	4	0	0	0	0	0	0	240	36	33
09:00	5	2	11	24	74	86	19	0	0	0	0	0	0	221	38	33
10:00	0	0	3	18	67	71	7	1	0	0	0	0	0	167	37	34
11:00	0	1	0	16	61	93	9	0	0	0	0	0	0	180	38	35
12 PM	0	0	2	22	83	78	17	0	0	0	0	0	0	202	38	34
13:00	0	0	5	23	84	76	11	0	0	0	0	0	0	199	37	34
14:00	0	1	2	42	100	100	12	0	0	0	0	0	0	257	37	33
15:00	0	0	10	82	227	129	11	0	0	0	0	0	0	459	36	33
16:00	0	1	5	160	354	144	10	0	0	0	0	0	0	674	35	32
17:00	0	0	8	169	291	162	16	0	0	0	0	0	0	646	36	32
18:00	0	0	5	46	149	115	19	0	0	0	0	0	0	334	37	33
19:00	0	0	3	13	49	73	16	1	0	0	0	0	0	155	38	35
20:00	0	0	2	10	25	44	4	0	0	0	0	0	0	85	38	34
21:00	0	0	0	6	28	38	1	0	0	0	0	0	0	73	37	34
22:00	0	0	0	2	14	18	10	0	0	0	0	0	0	44	40	36
23:00	0	0	0	1	11	4	5	0	0	0	0	0	0	21	40	35
Total	5	6	60	700	1874	1458	199	6	0	0	0	0	0	4308		
%	0.1%	0.1%	1.4%	16.2%	43.5%	33.8%	4.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	09:00	09:00	08:00	08:00	11:00	09:00	04:00						08:00		
Vol.	5	2	11	38	123	93	19	2						240		
PM Peak		14:00	15:00	17:00	16:00	17:00	18:00	19:00						16:00		
Vol.		1	10	169	354	162	19	1						674		

Stats

15th Percentile :	28 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	38 MPH
Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	3332
Percent in Pace :	77.3%
Number of Vehicles > 35 MPH :	1371
Percent of Vehicles > 35 MPH :	31.8%



PRECISION
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#737 Route 62
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WB

176038 E Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	2	1	4	0	0	0	0	0	0	0	7	37	33
01:00	0	0	1	0	1	1	1	0	0	0	0	0	0	4	41	33
02:00	0	0	0	0	0	1	1	0	0	0	0	0	0	2	42	40
03:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
04:00	0	0	0	0	2	5	1	1	1	0	0	0	0	10	46	39
05:00	0	0	0	1	11	18	6	0	0	0	0	0	0	36	39	36
06:00	0	0	3	3	26	72	5	1	0	0	0	0	0	110	38	35
07:00	0	0	4	11	110	89	8	1	0	0	0	0	0	223	37	34
08:00	0	3	9	37	138	84	9	0	0	0	0	0	0	280	37	33
09:00	0	0	1	19	105	92	10	0	0	0	0	0	0	227	37	34
10:00	0	0	3	20	57	77	14	1	0	0	0	0	0	172	38	34
11:00	0	0	2	21	75	95	16	0	0	0	0	0	0	209	38	34
12 PM	0	0	1	19	76	89	11	0	0	0	0	0	0	196	37	34
13:00	0	2	5	26	93	83	10	0	0	0	0	0	0	219	37	33
14:00	1	0	8	38	120	102	4	0	0	0	0	0	0	273	37	33
15:00	0	0	6	88	236	123	14	1	0	0	0	0	0	468	36	33
16:00	6	1	12	121	288	143	15	1	0	0	0	0	0	587	36	32
17:00	0	0	15	133	306	170	6	0	0	0	0	0	0	630	36	32
18:00	0	4	8	60	135	110	19	2	0	0	0	0	0	338	37	33
19:00	0	0	3	10	54	75	8	0	0	0	0	0	0	150	38	34
20:00	0	0	4	12	42	67	15	0	0	0	0	0	0	140	38	35
21:00	0	1	2	4	37	56	10	1	0	0	0	0	0	111	38	35
22:00	0	0	0	5	9	18	9	0	0	0	0	0	0	41	40	36
23:00	0	1	4	4	3	7	3	1	0	0	0	0	0	23	39	32
Total	7	12	91	634	1926	1582	195	10	1	0	0	0	0	4458		
%	0.2%	0.3%	2.0%	14.2%	43.2%	35.5%	4.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak Vol.		08:00 3	08:00 9	08:00 37	08:00 138	11:00 95	11:00 16	04:00 1	04:00 1					08:00 280		
PM Peak Vol.	16:00 6	18:00 4	17:00 15	17:00 133	17:00 306	17:00 170	18:00 19	18:00 2						17:00 630		

Stats

15th Percentile : 28 MPH
50th Percentile : 32 MPH
85th Percentile : 37 MPH
95th Percentile : 38 MPH

Mean Speed(Average) : 33 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 3508
Percent in Pace : 78.7%
Number of Vehicles > 35 MPH : 1472
Percent of Vehicles > 35 MPH : 33.0%



PRECISION
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 E Volume
Site Code: TBA

Start	EB		WB		Combin		ed		4/5/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Thu	
12:00	4	42	7	49	11	91				
12:15	0	50	1	42	1	92				
12:30	1	39	1	52	2	91				
12:45	0	55	0	53	0	108	14	382		
01:00	3	33	3	65	6	98				
01:15	0	40	1	59	1	99				
01:30	0	52	0	38	0	90				
01:45	0	46	1	50	1	96	8	383		
02:00	0	40	0	68	0	108				
02:15	1	43	1	57	2	100				
02:30	2	53	1	82	3	135				
02:45	1	41	2	62	3	103	8	446		
03:00	0	56	1	76	1	132				
03:15	1	49	0	110	1	159				
03:30	3	56	0	104	3	160				
03:45	2	46	0	119	2	165	7	616		
04:00	1	50	1	159	2	209				
04:15	2	35	2	174	4	209				
04:30	5	56	2	165	7	221				
04:45	6	47	1	188	7	235	20	874		
05:00	1	42	10	191	11	233				
05:15	12	58	6	176	18	234				
05:30	23	52	9	133	32	185				
05:45	24	48	12	133	36	181	97	833		
06:00	30	46	16	130	46	176				
06:15	30	36	23	114	53	150				
06:30	49	21	32	66	81	87				
06:45	71	44	31	65	102	109	282	522		
07:00	63	42	40	57	103	99				
07:15	86	31	29	45	115	76				
07:30	110	23	53	40	163	63				
07:45	99	21	63	32	174	53	543	291		
08:00	98	13	68	36	166	49				
08:15	92	22	53	26	145	48				
08:30	95	18	68	19	163	37				
08:45	102	13	47	21	149	34	623	168		
09:00	78	30	44	22	122	52				
09:15	77	27	52	15	129	42				
09:30	56	21	53	15	109	36				
09:45	61	9	44	23	105	32	465	162		
10:00	41	6	31	15	72	21				
10:15	57	16	39	11	96	27				
10:30	49	11	44	6	93	17				
10:45	45	8	55	8	100	16	361	81		
11:00	33	11	43	9	76	20				
11:15	45	5	42	6	87	11				
11:30	44	8	42	12	86	20				
11:45	45	1	63	9	108	10	357	61		
Total	1648	1612	1137	3207	2785	4819				
Percent	59.2%	33.5%	40.8%	66.5%						
Day Total		3260		4344		7604				
Peak	07:30	-	03:00	-	07:45	-	04:30	-	-	-
Vol.	399	-	207	-	252	-	720	-	923	-
P.H.F.	0.907	-	0.924	-	0.926	-	0.942	-	0.958	-



PRECISION
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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 E Volume
Site Code: TBA

Start	EB		WB		Combin		4/6/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Fri	
12:00	3	44	7	51	10	95		
12:15	0	46	3	57	3	103		
12:30	2	52	2	50	4	102		
12:45	1	46	1	56	2	102	402	
01:00	0	37	2	43	2	80		
01:15	1	50	1	58	2	108		
01:30	0	36	0	59	0	95		
01:45	0	52	0	48	0	100	383	
02:00	0	34	0	57	0	91		
02:15	0	39	0	67	0	106		
02:30	1	57	1	78	2	135		
02:45	3	56	0	87	3	143	475	
03:00	0	57	1	105	1	162		
03:15	0	55	2	134	2	189		
03:30	0	56	0	165	0	221		
03:45	4	46	0	178	4	224	796	
04:00	0	40	0	151	0	191		
04:15	1	45	3	170	4	215		
04:30	2	52	1	130	3	182		
04:45	4	45	1	140	5	185	773	
05:00	6	38	2	163	8	201		
05:15	7	47	11	215	18	262		
05:30	18	54	6	140	24	194		
05:45	21	47	6	116	27	163	820	
06:00	34	49	13	78	47	127		
06:15	25	45	22	79	47	124		
06:30	54	38	26	73	80	111		
06:45	48	25	45	58	93	83	445	
07:00	86	20	44	35	130	55		
07:15	82	22	49	29	131	51		
07:30	92	30	51	25	143	55		
07:45	87	27	68	30	155	57	218	
08:00	75	14	49	29	124	43		
08:15	104	25	66	22	170	47		
08:30	83	17	53	21	136	38		
08:45	80	11	51	22	131	33	161	
09:00	66	12	52	17	118	29		
09:15	76	19	37	15	113	34		
09:30	73	18	46	12	119	30		
09:45	58	11	51	9	109	20	113	
10:00	41	7	42	16	83	23		
10:15	50	7	46	17	96	24		
10:30	38	6	34	16	72	22		
10:45	51	10	50	17	101	27	96	
11:00	52	10	35	8	87	18		
11:15	53	7	55	10	108	17		
11:30	41	11	39	5	80	16		
11:45	51	5	39	5	90	10	61	
Total	1574	1577	1113	3166	2687	4743		
Percent	58.6%	33.2%	41.4%	66.8%				
Day Total	3151		4279		7430			
Peak	07:30	-	02:30	-	07:45	-	03:30	-
Vol.	358	-	225	-	236	-	664	-
P.H.F.	0.861	-	0.987	-	0.868	-	0.933	-



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west of Old Bedford Road
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176038 E Volume
Site Code: TBA

Start	EB		WB		Combin		4/7/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Sat	
12:00	4	57	7	52	11	109		
12:15	4	63	3	50	7	113		
12:30	0	35	2	60	2	95		
12:45	2	58	1	65	3	123	440	
01:00	1	66	1	53	2	119		
01:15	1	54	0	70	1	124		
01:30	1	53	1	62	2	115		
01:45	0	67	0	54	0	121	479	
02:00	1	46	0	76	1	122		
02:15	0	46	1	55	1	101		
02:30	1	49	0	77	1	126		
02:45	0	52	1	59	1	111	460	
03:00	0	50	0	58	0	108		
03:15	0	39	2	60	2	99		
03:30	2	47	1	57	3	104		
03:45	0	45	0	63	0	108	419	
04:00	1	45	0	61	1	106		
04:15	1	50	0	67	1	117		
04:30	1	46	2	30	3	76		
04:45	2	46	0	50	2	96	395	
05:00	1	38	1	46	2	84		
05:15	1	47	1	63	2	110		
05:30	2	30	5	48	7	78		
05:45	2	38	3	44	5	82	354	
06:00	7	50	1	52	8	102		
06:15	8	31	7	39	15	70		
06:30	6	33	7	46	13	79		
06:45	13	24	7	36	20	60	311	
07:00	8	41	15	39	23	80		
07:15	19	21	15	36	34	57		
07:30	13	24	21	34	34	58		
07:45	21	12	23	28	44	40	235	
08:00	18	23	18	19	36	42		
08:15	24	22	23	27	47	49		
08:30	33	13	30	14	63	27		
08:45	34	18	37	26	71	44	162	
09:00	41	20	19	16	60	36		
09:15	45	19	36	17	81	36		
09:30	53	12	34	17	87	29		
09:45	51	10	42	12	93	22	123	
10:00	44	14	41	9	85	23		
10:15	47	17	38	13	85	30		
10:30	48	12	52	13	100	25		
10:45	36	11	49	16	85	27	105	
11:00	52	11	49	11	101	22		
11:15	47	8	47	16	94	24		
11:30	38	12	48	4	86	16		
11:45	50	5	49	6	99	11	73	
Total	784	1630	740	1926	1524	3556		
Percent	51.4%	45.8%	48.6%	54.2%				
Day Total		2414		2666		5080		
Peak	09:30	-	01:00	-	10:30	-	01:15	-
Vol.	195	-	240	-	197	-	482	-
P.H.F.	0.920	-	0.896	-	0.947	-	0.972	-



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176038 E Volume
Site Code: TBA

Start	EB		WB		Combin		4/8/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Sun	
12:00	6	40	9	35	15	75		
12:15	1	53	2	46	3	99		
12:30	3	33	2	58	5	91		
12:45	0	65	1	61	1	126	391	
01:00	3	54	4	58	7	112		
01:15	1	53	1	61	2	114		
01:30	1	49	1	58	2	107		
01:45	1	59	0	45	1	104	437	
02:00	0	36	1	50	1	86		
02:15	0	40	0	46	0	86		
02:30	1	31	1	56	2	87		
02:45	0	50	0	45	0	95	354	
03:00	2	40	1	46	3	86		
03:15	0	42	1	44	1	86		
03:30	0	50	0	30	0	80		
03:45	1	53	0	43	1	96	348	
04:00	0	34	0	52	0	86		
04:15	1	38	0	60	1	98		
04:30	0	35	1	46	1	81		
04:45	0	26	0	42	0	68	333	
05:00	0	43	2	49	2	92		
05:15	1	39	1	45	2	84		
05:30	2	27	6	45	8	72		
05:45	0	39	1	45	1	84	332	
06:00	4	28	1	35	5	63		
06:15	6	40	6	31	12	71		
06:30	6	25	7	36	13	61		
06:45	13	17	6	29	19	46	241	
07:00	6	20	10	35	16	55		
07:15	10	21	10	29	20	50		
07:30	15	29	15	19	30	48		
07:45	17	14	19	17	36	31	184	
08:00	18	18	15	22	33	40		
08:15	21	12	18	14	39	26		
08:30	25	12	17	17	42	29		
08:45	29	5	31	14	60	19	114	
09:00	33	11	26	4	59	15		
09:15	40	6	26	11	66	17		
09:30	35	4	35	10	70	14		
09:45	37	7	37	9	74	16	62	
10:00	30	5	32	18	62	23		
10:15	33	2	40	9	73	11		
10:30	29	4	36	4	65	8		
10:45	40	1	35	1	75	2	44	
11:00	36	3	50	3	86	6		
11:15	50	4	49	6	99	10		
11:30	47	3	67	4	114	7		
11:45	53	0	48	0	101	0	23	
Total	657	1320	671	1543	1328	2863		
Percent	49.5%	46.1%	50.5%	53.9%				
Day Total	1977		2214		4191			
Peak	11:00	- 00:45	- 11:00	- 00:30	- 11:00	- 00:45	- -	-
Vol.	186	- 221	- 214	- 238	- 400	- 459	- -	-
P.H.F.	0.877	0.850	0.799	0.975	0.877	0.911		



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 E Volume
Site Code: TBA

Start	EB		WB		Combin		4/9/2018	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Mon	
12:00	1	37	6	37	7	74		
12:15	0	45	4	57	4	102		
12:30	0	34	1	53	1	87		
12:45	0	50	0	56	0	106	369	
01:00	2	40	0	56	2	96		
01:15	0	29	2	43	2	72		
01:30	0	49	0	46	0	95		
01:45	0	34	1	45	1	79	342	
02:00	0	37	1	47	1	84		
02:15	1	37	0	51	1	88		
02:30	0	45	0	56	0	101		
02:45	0	42	1	61	1	103	376	
03:00	0	52	1	101	1	153		
03:15	1	58	0	106	1	164		
03:30	1	48	1	121	2	169		
03:45	4	43	1	103	5	146	632	
04:00	2	51	1	131	3	182		
04:15	2	37	2	142	4	179		
04:30	3	46	2	142	5	188		
04:45	1	43	7	171	8	214	763	
05:00	12	39	3	168	15	207		
05:15	9	70	11	200	20	270		
05:30	22	52	9	164	31	216		
05:45	22	46	12	157	34	203	896	
06:00	35	41	20	109	55	150		
06:15	37	53	20	97	57	150		
06:30	48	49	35	83	83	132		
06:45	62	23	34	62	96	85	517	
07:00	94	30	37	56	131	86		
07:15	93	38	48	27	141	65		
07:30	87	22	61	44	148	66		
07:45	96	19	63	21	159	40	257	
08:00	88	20	62	17	150	37		
08:15	83	14	59	16	142	30		
08:30	119	10	53	14	172	24		
08:45	92	16	55	20	147	36	127	
09:00	66	10	48	24	114	34		
09:15	65	20	61	12	126	32		
09:30	52	10	50	11	102	21		
09:45	61	7	35	7	96	14	101	
10:00	50	11	32	6	82	17		
10:15	60	4	36	4	96	8		
10:30	50	4	32	11	82	15		
10:45	41	6	33	14	74	20	60	
11:00	24	5	47	5	71	10		
11:15	29	3	40	6	69	9		
11:30	37	1	47	0	84	1		
11:45	48	2	34	4	82	6	26	
Total	1600	1482	1108	2984	2708	4466		
Percent	59.1%	33.2%	40.9%	66.8%				
Day Total		3082		4092		7174		
Peak	07:45	-	05:15	-	07:30	-	04:45	-
Vol.	386	-	209	-	245	-	703	-
P.H.F.	0.811	-	0.746	-	0.972	-	0.879	-



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#737 Route 62
west of Old Bedford Road
City, State: Concord, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 E Volume
Site Code: TBA

Start	EB		WB		Combin		4/10/201	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	8	Tue
12:00	0	51	0	42	0	93		
12:15	1	50	2	48	3	98		
12:30	1	45	0	51	1	96		
12:45	0	56	1	61	1	117	404	
01:00	2	46	1	45	3	91		
01:15	0	45	0	47	0	92		
01:30	0	27	0	57	0	84		
01:45	0	47	0	50	0	97	364	
02:00	0	42	1	62	1	104		
02:15	1	37	0	59	1	96		
02:30	0	47	0	77	0	124		
02:45	0	45	1	59	1	104	428	
03:00	1	68	0	85	1	153		
03:15	0	49	1	113	1	162		
03:30	1	49	1	130	2	179		
03:45	3	46	1	131	4	177	671	
04:00	1	59	1	148	2	207		
04:15	5	44	0	173	5	217		
04:30	5	33	6	192	11	225		
04:45	4	60	0	161	4	221	870	
05:00	8	49	5	168	13	217		
05:15	13	68	5	200	18	268		
05:30	31	53	15	161	46	214		
05:45	14	37	14	117	28	154	853	
06:00	30	32	24	119	54	151		
06:15	28	52	23	91	51	143		
06:30	41	38	30	60	71	98		
06:45	66	41	29	64	95	105	497	
07:00	73	28	31	51	104	79		
07:15	93	26	50	40	143	66		
07:30	118	27	50	42	168	69		
07:45	96	23	59	22	155	45	259	
08:00	88	21	59	23	147	44		
08:15	100	14	69	17	169	31		
08:30	94	20	54	22	148	42		
08:45	80	19	58	23	138	42	159	
09:00	67	16	57	32	124	48		
09:15	52	15	53	13	105	28		
09:30	68	12	54	18	122	30		
09:45	41	7	57	10	98	17	123	
10:00	46	7	45	11	91	18		
10:15	53	12	49	4	102	16		
10:30	43	5	35	18	78	23		
10:45	56	3	38	11	94	14	71	
11:00	34	7	45	5	79	12		
11:15	47	4	48	9	95	13		
11:30	39	6	46	5	85	11		
11:45	40	0	41	2	81	2	38	
Total	1584	1588	1159	3149	2743	4737		
Percent	57.7%	33.5%	42.3%	66.5%				
Day Total	3172		4308		7480			
Peak	07:30	-	04:45	-	07:45	-	04:30	-
Vol.	402	-	230	-	241	-	931	-
P.H.F.	0.852	-	0.846	-	0.873	-	0.945	-



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west of Old Bedford Road
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176038 E Volume
Site Code: TBA

Start	EB		WB		Combin		ed		4/11/201	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	8	Wed
12:00	3	52	3	38	6	90				
12:15	1	51	3	45	4	96				
12:30	0	52	0	53	0	105				
12:45	0	47	1	60	1	107	11	398		
01:00	0	43	2	58	2	101				
01:15	0	42	2	51	2	93				
01:30	0	53	0	50	0	103				
01:45	0	37	0	60	0	97	4	394		
02:00	0	42	0	69	0	111				
02:15	1	41	0	60	1	101				
02:30	0	53	0	60	0	113				
02:45	1	43	2	84	3	127	4	452		
03:00	2	64	0	104	2	168				
03:15	0	62	1	98	1	160				
03:30	1	48	0	139	1	187				
03:45	3	60	1	127	4	187	8	702		
04:00	2	52	1	131	3	183				
04:15	2	65	2	149	4	214				
04:30	4	61	3	132	7	193				
04:45	7	51	4	175	11	226	25	816		
05:00	7	54	2	163	9	217				
05:15	8	55	10	167	18	222				
05:30	13	41	10	173	23	214				
05:45	31	58	14	127	45	185	95	838		
06:00	25	43	11	92	36	135				
06:15	38	56	24	110	62	166				
06:30	36	40	33	76	69	116				
06:45	74	33	42	60	116	93	283	510		
07:00	92	31	49	46	141	77				
07:15	83	39	56	31	139	70				
07:30	113	28	53	36	166	64				
07:45	97	26	65	37	162	63	608	274		
08:00	98	25	71	35	169	60				
08:15	100	26	73	51	173	77				
08:30	89	21	58	31	147	52				
08:45	83	14	78	23	161	37	650	226		
09:00	85	12	60	30	145	42				
09:15	71	17	64	34	135	51				
09:30	66	23	59	30	125	53				
09:45	60	12	44	17	104	29	509	175		
10:00	59	11	41	15	100	26				
10:15	42	4	45	10	87	14				
10:30	53	5	37	9	90	14				
10:45	42	4	49	7	91	11	368	65		
11:00	36	9	53	6	89	15				
11:15	47	8	48	7	95	15				
11:30	43	4	52	7	95	11				
11:45	36	3	56	3	92	6	371	47		
Total	1654	1721	1282	3176	2936	4897				
Percent	56.3%	35.1%	43.7%	64.9%						
Day Total		3375		4458		7833				
Peak	07:30	-	03:45	-	08:00	-	04:45	-	-	-
Vol.	408	-	238	-	280	-	678	-	879	-
P.H.F.	0.903	-	0.915	-	0.897	-	0.969	-	0.968	-



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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	1	3	0	0	0	0	0	0	0	0	0	0	4
01:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	3	3	0	1	0	0	0	0	0	0	0	0	7
05:00	0	38	12	0	7	0	0	0	0	0	0	0	0	57
06:00	0	41	13	2	5	1	0	0	0	0	0	0	0	62
07:00	0	40	7	3	3	1	0	0	0	0	0	0	0	54
08:00	0	37	13	2	5	0	0	0	0	0	0	0	0	57
09:00	3	60	20	1	7	1	0	2	0	0	0	0	0	94
10:00	1	46	15	2	8	1	0	1	0	0	0	0	0	74
11:00	0	46	19	1	8	0	0	0	0	0	0	0	0	74
12 PM	0	37	8	1	3	0	1	0	1	0	0	0	0	51
13:00	0	48	9	1	2	0	0	0	0	0	0	0	0	60
14:00	0	36	9	1	1	0	0	0	0	0	0	0	0	47
15:00	0	31	8	2	2	0	0	0	0	0	0	0	0	43
16:00	0	14	4	2	0	0	0	0	0	0	0	0	0	20
17:00	2	15	12	2	1	0	0	0	0	0	0	0	0	32
18:00	0	11	5	2	0	0	0	0	0	0	0	0	0	18
19:00	0	7	2	1	2	0	0	0	0	0	0	0	0	12
20:00	0	5	1	0	0	0	0	0	0	0	0	0	0	6
21:00	0	7	1	0	0	0	0	0	0	0	0	0	0	8
22:00	0	4	4	1	0	0	0	0	0	0	0	0	0	9
23:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
Total	6	531	170	24	55	4	1	3	1	0	0	0	0	795
Percent	0.8%	66.8%	21.4%	3.0%	6.9%	0.5%	0.1%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	09:00	09:00	09:00	07:00	10:00	06:00		09:00						09:00
Vol.	3	60	20	3	8	1		2						94
PM Peak	17:00	13:00	17:00	15:00	12:00		12:00		12:00					13:00
Vol.	2	48	12	2	3		1		1					60



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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	5	2	0	0	0	0	0	0	0	0	0	0	7
03:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
04:00	0	9	2	0	0	0	0	0	0	0	0	0	0	11
05:00	1	32	16	0	11	0	0	0	0	0	0	0	0	60
06:00	0	42	13	5	5	1	0	0	0	0	0	0	0	66
07:00	0	45	17	2	4	0	0	0	0	0	0	0	0	68
08:00	0	64	16	3	6	0	0	1	0	0	0	0	0	90
09:00	0	61	11	2	6	0	0	0	0	0	0	0	0	80
10:00	0	39	10	1	5	1	0	0	0	0	0	0	0	56
11:00	0	34	8	1	7	0	0	1	0	0	0	0	0	51
12 PM	0	34	8	1	7	1	0	0	0	0	0	0	0	51
13:00	0	35	6	1	1	0	0	0	0	0	0	0	0	43
14:00	0	30	9	1	2	0	0	0	0	0	0	0	0	42
15:00	2	19	8	1	1	0	1	0	0	0	0	0	0	32
16:00	0	16	4	1	1	0	0	0	0	0	0	0	0	22
17:00	0	13	8	3	1	0	0	0	0	0	0	0	0	25
18:00	0	9	7	2	0	0	0	0	0	0	0	0	0	18
19:00	0	10	3	1	0	0	0	0	0	0	0	0	0	14
20:00	0	2	7	0	0	0	0	0	0	0	0	0	0	9
21:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
22:00	0	3	2	1	1	0	0	0	0	0	0	0	0	7
23:00	0	3	1	0	0	0	0	0	0	0	0	0	0	4
Total	3	512	159	26	58	3	1	2	0	0	0	0	0	764
Percent	0.4%	67.0%	20.8%	3.4%	7.6%	0.4%	0.1%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	05:00	08:00	07:00	06:00	05:00	06:00		08:00						08:00
Vol.	1	64	17	5	11	1		1						90
PM Peak	15:00	13:00	14:00	17:00	12:00	12:00	15:00							12:00
Vol.	2	35	9	3	7	1	1							51



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176038 F Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/09/1														
8	0	1	1	0	0	0	0	0	0	0	0	0	0	2
01:00	0	2	0	0	1	0	0	0	0	0	0	0	0	3
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	9	2	0	3	0	0	0	0	0	0	0	0	14
05:00	0	39	14	1	8	0	0	0	0	0	0	0	0	62
06:00	1	44	18	2	5	2	0	0	0	0	0	0	0	72
07:00	0	47	12	3	7	0	0	0	0	0	0	0	0	69
08:00	0	58	12	3	5	0	0	0	0	0	0	0	0	78
09:00	0	54	19	1	6	0	0	0	0	0	0	0	0	80
10:00	0	43	16	2	11	0	0	0	0	0	0	0	0	72
11:00	1	33	17	1	2	0	0	0	0	0	0	0	0	54
12 PM	0	61	15	1	5	0	0	0	0	0	0	0	0	82
13:00	0	39	12	1	3	1	0	0	0	0	0	0	0	56
14:00	0	34	10	1	3	0	0	0	0	0	0	0	0	48
15:00	0	28	3	2	3	0	0	0	0	0	0	0	0	36
16:00	0	14	5	2	1	0	0	0	0	0	0	0	0	22
17:00	0	16	3	2	0	0	0	0	0	0	0	0	0	21
18:00	0	10	6	2	0	0	0	0	0	0	0	0	0	18
19:00	0	8	0	1	2	0	0	0	0	0	0	0	0	11
20:00	0	5	2	0	0	0	0	0	0	0	0	0	0	7
21:00	0	5	2	0	0	0	0	0	1	0	0	0	0	8
22:00	0	1	2	1	1	0	0	0	0	0	0	0	0	5
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	552	171	26	66	3	0	0	1	0	0	0	0	821
Percent	0.2%	67.2%	20.8%	3.2%	8.0%	0.4%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	08:00	09:00	07:00	10:00	06:00								09:00
Vol.	1	58	19	3	11	2								80
PM Peak		12:00	12:00	15:00	12:00	13:00			21:00					12:00
Vol.		61	15	2	5	1			1					82



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176038 F Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/10/1														
8	0	0	1	0	0	0	0	0	0	0	0	0	0	1
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	7	4	0	0	0	0	0	0	0	0	0	0	11
05:00	0	38	18	0	6	0	0	0	0	0	0	0	0	62
06:00	2	41	12	2	10	0	0	1	0	0	0	0	0	68
07:00	1	57	16	2	2	1	0	0	0	0	0	0	0	79
08:00	0	52	15	2	6	0	0	0	0	0	0	0	0	75
09:00	2	59	25	4	8	1	0	0	0	0	0	0	0	99
10:00	1	41	11	1	6	0	0	0	0	0	0	0	0	60
11:00	0	19	11	1	7	0	0	0	0	0	0	0	0	38
12 PM	0	34	11	1	7	0	1	1	0	0	0	0	0	55
13:00	0	38	6	2	4	0	0	1	0	0	0	0	0	51
14:00	0	32	8	1	7	0	0	0	0	0	0	0	0	48
15:00	0	37	6	1	1	0	0	0	1	0	0	0	0	46
16:00	0	16	9	2	0	0	0	0	0	0	0	0	0	27
17:00	0	8	9	3	1	0	0	0	0	0	0	0	0	21
18:00	0	15	2	2	0	1	0	0	0	0	0	0	0	20
19:00	0	10	5	1	1	0	0	0	0	0	0	0	0	17
20:00	0	0	4	0	0	0	0	0	0	0	0	0	0	4
21:00	0	6	4	0	0	0	0	0	0	0	0	0	0	10
22:00	0	7	1	1	1	0	0	0	0	0	0	0	0	10
23:00	0	3	2	0	0	0	0	0	0	0	0	0	0	5
Total	6	522	180	26	67	3	1	3	1	0	0	0	0	809
Percent	0.7%	64.5%	22.2%	3.2%	8.3%	0.4%	0.1%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	09:00	09:00	09:00	06:00	07:00		06:00						09:00
Vol.	2	59	25	4	10	1		1						99
PM Peak		13:00	12:00	17:00	12:00	18:00	12:00	12:00	15:00					12:00
Vol.		38	11	3	7	1	1	1	1					55



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	2	1	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	6	4	0	1	0	0	0	0	0	0	0	0	11
05:00	3	43	9	0	10	0	0	0	0	0	0	0	0	65
06:00	0	27	12	4	4	0	0	0	0	0	0	0	0	47
07:00	0	43	12	1	5	0	0	0	0	0	0	0	0	61
08:00	1	48	10	3	5	0	0	0	0	0	0	0	0	67
09:00	1	59	21	3	12	2	0	1	0	0	0	0	0	99
10:00	1	51	13	2	10	0	0	1	0	0	0	0	0	78
11:00	2	37	16	1	1	0	0	0	0	0	0	0	0	57
12 PM	0	40	15	1	6	0	0	0	0	0	0	0	0	62
13:00	0	42	10	3	5	0	0	0	0	0	0	0	0	60
14:00	0	46	14	1	2	1	0	0	0	0	0	0	0	64
15:00	0	24	13	1	3	0	0	0	0	0	0	0	0	41
16:00	0	18	4	2	2	0	0	0	0	0	0	0	0	26
17:00	0	20	5	2	0	0	0	0	0	0	0	0	0	27
18:00	0	10	3	2	0	0	0	0	0	0	0	0	0	15
19:00	0	8	5	1	1	0	0	0	0	0	0	0	0	15
20:00	0	2	3	0	0	0	0	0	0	0	0	0	0	5
21:00	0	3	5	0	0	0	0	0	0	0	0	0	0	8
22:00	0	5	4	1	1	0	0	0	0	0	0	0	0	11
23:00	0	3	3	0	0	0	0	0	0	0	0	0	0	6
Total	8	541	184	28	68	3	0	2	0	0	0	0	0	834
Percent	1.0%	64.9%	22.1%	3.4%	8.2%	0.4%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	05:00	09:00	09:00	06:00	09:00	09:00		09:00						09:00
Vol.	3	59	21	4	12	2		1						99
PM Peak		14:00	12:00	13:00	12:00	14:00								14:00
Vol.		46	15	3	6	1								64



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SB

176038 F Class
Site Code: TBA

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/05/1														
8	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	33	11	0	2	0	0	0	0	0	0	0	0	46
02:00	0	4	1	1	0	0	0	0	0	0	0	0	0	6
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	4	2	1	0	0	0	0	0	0	0	0	0	7
06:00	0	12	3	2	1	0	0	0	0	0	0	0	0	18
07:00	0	15	6	2	0	1	0	0	0	0	0	0	0	24
08:00	0	11	5	2	4	0	0	0	0	0	0	0	0	22
09:00	0	24	13	1	3	0	0	0	0	0	0	0	0	41
10:00	1	33	9	2	1	1	0	2	0	0	0	0	0	49
11:00	1	39	20	1	3	1	0	0	0	0	0	0	0	65
12 PM	0	51	13	1	2	2	0	0	0	0	0	0	0	69
13:00	0	47	16	1	5	0	0	0	0	0	0	0	0	69
14:00	0	72	14	0	8	0	0	0	1	0	0	0	0	95
15:00	0	53	13	1	5	0	0	0	0	0	0	0	0	72
16:00	0	34	9	2	1	0	0	0	0	0	0	0	0	46
17:00	0	40	6	2	2	0	0	0	0	0	0	0	0	50
18:00	0	30	11	2	3	0	0	0	0	0	0	0	0	46
19:00	0	17	3	1	2	0	0	0	0	0	0	0	0	23
20:00	0	10	9	0	0	0	0	0	0	0	0	0	0	19
21:00	0	9	1	0	1	0	0	0	0	0	0	0	0	11
22:00	0	17	4	1	0	0	0	0	0	0	0	0	0	22
23:00	0	12	1	0	1	0	0	0	0	0	0	0	0	14
Total	2	571	170	23	44	5	0	2	1	0	0	0	0	818
Percent	0.2%	69.8%	20.8%	2.8%	5.4%	0.6%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	11:00	11:00	06:00	08:00	07:00		10:00						11:00
Vol.	1	39	20	2	4	1		2						65
PM Peak		14:00	13:00	16:00	14:00	12:00			14:00					14:00
Vol.		72	16	2	8	2			1					95



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176038 F Class
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Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/06/1														
8	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	31	7	0	5	0	0	0	0	0	0	0	0	43
03:00	0	6	0	0	2	0	0	0	0	0	0	0	0	8
04:00	0	2	1	0	0	0	0	0	0	0	0	0	0	3
05:00	3	4	2	0	1	0	0	0	0	0	0	0	0	10
06:00	0	11	3	4	0	0	0	0	0	0	0	0	0	18
07:00	0	20	5	3	2	0	0	0	0	0	0	0	0	30
08:00	0	21	3	4	3	1	0	0	0	0	0	0	0	32
09:00	0	23	9	2	2	0	0	0	0	0	0	0	0	36
10:00	0	35	10	1	5	0	0	2	0	0	0	0	0	53
11:00	0	41	20	1	2	0	0	1	0	0	0	0	0	65
12 PM	1	37	9	1	5	1	0	0	0	0	0	0	0	54
13:00	0	59	12	1	4	0	0	0	0	0	0	0	0	76
14:00	0	50	13	1	6	0	0	0	0	0	0	0	0	70
15:00	0	30	9	1	2	0	0	0	0	0	0	0	0	42
16:00	1	35	13	1	1	1	0	0	0	0	0	0	0	52
17:00	0	34	5	3	2	0	0	0	0	0	0	0	0	44
18:00	0	30	9	2	2	0	0	0	0	0	0	0	0	43
19:00	0	15	3	1	0	0	0	0	0	0	0	0	0	19
20:00	0	12	6	0	0	0	0	0	0	0	0	0	0	18
21:00	0	6	2	0	0	0	0	0	0	0	0	0	0	8
22:00	0	8	2	1	0	0	0	0	0	0	0	0	0	11
23:00	0	20	3	0	2	0	0	0	0	0	0	0	0	25
Total	5	533	146	27	46	3	0	3	0	0	0	0	0	763
Percent	0.7%	69.9%	19.1%	3.5%	6.0%	0.4%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	05:00	11:00	11:00	06:00	02:00	08:00		10:00						11:00
Vol.	3	41	20	4	5	1		2						65
PM Peak	12:00	13:00	14:00	17:00	14:00	12:00								13:00
Vol.	1	59	13	3	6	1								76



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04/09/1														
8	0	10	5	0	0	0	0	0	0	0	0	0	0	15
01:00	0	9	0	0	0	0	0	0	0	0	0	0	0	9
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	2	1	0	0	1	0	0	0	0	0	0	0	4
05:00	0	4	0	1	0	0	0	0	0	0	0	0	0	5
06:00	0	13	6	3	0	1	0	0	0	0	0	0	0	23
07:00	1	24	4	2	2	0	0	0	0	0	0	0	0	33
08:00	0	19	8	5	0	0	0	0	0	0	0	0	0	32
09:00	0	19	13	1	6	0	0	1	0	0	0	0	0	40
10:00	1	24	15	2	3	1	0	0	0	0	0	0	0	46
11:00	0	35	18	1	2	0	0	1	0	0	0	0	0	57
12 PM	0	37	10	2	3	0	0	0	0	0	0	0	0	52
13:00	0	40	16	1	7	1	0	0	0	0	0	0	0	65
14:00	0	54	19	1	7	0	0	0	0	0	0	0	0	81
15:00	0	45	15	1	4	0	0	0	0	0	0	0	0	65
16:00	0	42	9	2	3	0	0	0	0	0	0	0	0	56
17:00	0	38	8	2	3	0	0	0	0	0	0	0	0	51
18:00	0	38	10	2	2	0	0	0	0	0	0	0	0	52
19:00	0	16	5	1	0	0	0	0	0	0	0	0	0	22
20:00	0	16	4	0	0	0	0	0	0	0	0	0	0	20
21:00	0	13	5	0	0	0	0	0	0	0	0	0	0	18
22:00	0	7	1	1	0	0	0	0	0	0	0	0	0	9
23:00	0	13	1	0	1	0	0	0	0	0	0	0	0	15
Total	2	518	173	28	43	4	0	2	0	0	0	0	0	770
Percent	0.3%	67.3%	22.5%	3.6%	5.6%	0.5%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	11:00	11:00	08:00	09:00	04:00		09:00						11:00
Vol.	1	35	18	5	6	1		1						57
PM Peak		14:00	14:00	12:00	13:00	13:00								14:00
Vol.		54	19	2	7	1								81



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04/10/1														
8	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2
02:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	1	6	0	0	0	0	0	0	0	0	0	0	7
06:00	0	11	2	2	1	0	0	0	0	0	0	0	0	16
07:00	1	17	8	2	4	0	0	0	0	0	0	0	0	32
08:00	0	18	8	1	4	0	0	1	0	0	0	0	0	32
09:00	0	31	9	4	2	0	0	0	0	0	0	0	0	46
10:00	1	31	21	1	1	1	0	3	0	0	0	0	0	59
11:00	0	28	8	1	6	0	0	0	0	0	0	0	0	43
12 PM	0	37	14	1	4	0	0	0	0	0	0	0	0	56
13:00	1	43	13	1	3	1	0	1	0	0	0	0	0	63
14:00	0	61	22	1	5	0	0	0	0	0	0	0	0	89
15:00	1	49	13	1	6	1	0	0	0	0	0	0	0	71
16:00	0	48	12	3	0	0	0	0	0	0	0	0	0	63
17:00	0	44	7	2	2	0	0	0	0	0	0	0	0	55
18:00	0	37	12	3	1	1	0	0	0	0	0	0	0	54
19:00	0	21	7	1	2	0	0	0	0	0	0	0	0	31
20:00	0	10	6	0	1	0	0	0	0	0	0	0	0	17
21:00	0	8	6	0	2	0	0	0	0	0	0	0	0	16
22:00	0	8	5	1	0	0	0	0	0	0	0	0	0	14
23:00	0	16	3	1	1	0	0	0	0	0	0	0	0	21
Total	4	525	183	26	45	4	0	5	0	0	0	0	0	792
Percent	0.5%	66.3%	23.1%	3.3%	5.7%	0.5%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	09:00	10:00	09:00	11:00	10:00		10:00						10:00
Vol.	1	31	21	4	6	1		3						59
PM Peak	13:00	14:00	14:00	16:00	15:00	13:00		13:00						14:00
Vol.	1	61	22	3	6	1		1						89



PRECISION
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Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
04/11/1														
8	0	1	1	0	0	0	0	0	0	0	0	0	0	2
01:00	0	29	10	0	1	0	0	0	0	0	0	0	0	40
02:00	0	8	1	0	0	0	0	0	0	0	0	0	0	9
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
04:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
05:00	0	5	2	0	0	0	0	0	0	0	0	0	0	7
06:00	2	14	3	3	1	0	0	0	0	0	0	0	0	23
07:00	0	12	5	3	0	0	0	0	0	0	0	0	0	20
08:00	0	15	9	3	3	0	0	0	0	0	0	0	0	30
09:00	1	30	8	4	4	0	0	0	0	0	0	0	0	47
10:00	0	24	12	1	4	1	0	1	0	0	0	0	0	43
11:00	2	38	13	2	2	0	0	1	0	0	0	0	0	58
12 PM	2	46	10	1	1	0	0	0	0	0	0	0	0	60
13:00	0	39	18	3	3	0	0	1	0	0	0	0	0	64
14:00	1	72	18	1	8	0	0	0	0	0	0	0	0	100
15:00	1	56	20	1	4	0	0	0	0	0	0	0	0	82
16:00	0	32	12	2	3	0	0	0	0	0	0	0	0	49
17:00	0	31	11	2	1	0	0	0	0	0	0	0	0	45
18:00	0	41	8	2	1	0	0	0	0	0	0	0	0	52
19:00	0	23	13	1	0	0	0	0	0	0	0	0	0	37
20:00	0	18	2	0	0	0	0	0	0	0	0	0	0	20
21:00	0	11	4	0	1	0	0	0	0	0	0	0	0	16
22:00	0	7	4	1	0	0	0	0	0	0	0	0	0	12
23:00	0	15	2	0	2	0	0	0	0	0	0	0	0	19
Total	9	573	186	30	39	1	0	3	0	0	0	0	0	841
Percent	1.1%	68.1%	22.1%	3.6%	4.6%	0.1%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	06:00	11:00	11:00	09:00	09:00	10:00		10:00						11:00
Vol.	2	38	13	4	4	1		1						58
PM Peak	12:00	14:00	15:00	13:00	14:00			13:00						14:00
Vol.	2	72	20	3	8			1						100



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	1	2	0	0	0	1	0	0	0	0	0	0	0	4	36	20
01:00	0	1	1	0	0	0	0	0	0	0	0	0	0	2	22	20
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	1	0	0	0	0	0	1	0	0	0	0	0	2	47	32
04:00	0	1	3	0	0	1	2	0	0	0	0	0	0	7	41	29
05:00	1	2	4	9	16	17	5	3	0	0	0	0	0	57	38	33
06:00	0	7	9	9	22	13	1	1	0	0	0	0	0	62	36	30
07:00	2	11	11	5	17	7	0	1	0	0	0	0	0	54	33	26
08:00	2	8	8	13	11	14	0	1	0	0	0	0	0	57	36	28
09:00	3	16	12	10	29	15	8	1	0	0	0	0	0	94	37	29
10:00	0	10	8	9	26	13	7	1	0	0	0	0	0	74	37	30
11:00	1	7	12	6	15	25	7	0	1	0	0	0	0	74	38	31
12 PM	0	10	6	3	14	12	5	1	0	0	0	0	0	51	38	30
13:00	0	14	9	9	15	10	2	1	0	0	0	0	0	60	36	28
14:00	1	6	8	8	8	8	8	0	0	0	0	0	0	47	39	30
15:00	1	7	5	2	9	11	7	1	0	0	0	0	0	43	40	31
16:00	0	4	2	2	4	3	5	0	0	0	0	0	0	20	41	31
17:00	1	4	3	10	8	4	1	1	0	0	0	0	0	32	35	28
18:00	0	4	3	3	5	3	0	0	0	0	0	0	0	18	34	27
19:00	0	4	1	3	2	2	0	0	0	0	0	0	0	12	34	26
20:00	0	1	0	1	2	2	0	0	0	0	0	0	0	6	36	30
21:00	0	1	0	1	1	4	1	0	0	0	0	0	0	8	38	33
22:00	0	0	0	0	3	4	2	0	0	0	0	0	0	9	40	36
23:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
Total	13	121	105	103	208	170	61	13	1	0	0	0	0	795		
%	1.6%	15.2%	13.2%	13.0%	26.2%	21.4%	7.7%	1.6%	0.1%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	09:00	09:00	08:00	09:00	11:00	09:00	05:00	11:00					09:00		
Vol.	3	16	12	13	29	25	8	3	1					94		
PM Peak	14:00	13:00	13:00	17:00	13:00	12:00	14:00	12:00						13:00		
Vol.	1	14	9	10	15	12	8	1						60		

Stats

15th Percentile :	18 MPH
50th Percentile :	30 MPH
85th Percentile :	37 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	29 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	378
Percent in Pace :	47.5%
Number of Vehicles > 35 MPH :	211
Percent of Vehicles > 35 MPH :	26.5%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/ 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	1	0	0	0	0	0	1	48	47
02:00	0	2	4	1	0	0	0	0	0	0	0	0	0	7	23	21
03:00	0	1	2	0	0	2	0	0	0	0	0	0	0	5	37	27
04:00	1	0	2	2	2	2	1	1	0	0	0	0	0	11	40	30
05:00	0	4	6	7	20	15	7	1	0	0	0	0	0	60	38	32
06:00	3	4	4	8	18	21	6	2	0	0	0	0	0	66	38	32
07:00	1	10	5	10	11	20	10	1	0	0	0	0	0	68	39	31
08:00	1	14	10	4	21	26	9	4	1	0	0	0	0	90	39	31
09:00	9	11	8	16	20	11	5	0	0	0	0	0	0	80	35	26
10:00	5	7	8	9	15	7	4	0	1	0	0	0	0	56	36	27
11:00	0	11	8	8	11	6	5	2	0	0	0	0	0	51	38	29
12 PM	2	11	7	9	11	8	2	1	0	0	0	0	0	51	36	27
13:00	3	10	8	5	10	3	4	0	0	0	0	0	0	43	34	26
14:00	2	9	9	5	3	9	4	1	0	0	0	0	0	42	38	27
15:00	5	4	5	5	6	6	1	0	0	0	0	0	0	32	35	25
16:00	4	2	1	2	8	2	3	0	0	0	0	0	0	22	38	27
17:00	1	5	4	7	4	3	1	0	0	0	0	0	0	25	34	26
18:00	2	2	2	1	2	6	3	0	0	0	0	0	0	18	39	30
19:00	0	4	3	3	3	0	1	0	0	0	0	0	0	14	32	25
20:00	0	1	1	1	1	5	0	0	0	0	0	0	0	9	37	31
21:00	0	1	0	0	0	1	0	0	0	0	0	0	0	2	37	27
22:00	1	3	1	1	0	1	0	0	0	0	0	0	0	7	28	21
23:00	0	0	1	0	0	2	0	1	0	0	0	0	0	4	46	36
Total	40	116	99	104	166	156	66	15	2	0	0	0	0	764		
%	5.2%	15.2%	13.0%	13.6%	21.7%	20.4%	8.6%	2.0%	0.3%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	08:00	08:00	09:00	08:00	08:00	07:00	08:00	08:00					08:00		
Vol.	9	14	10	16	21	26	10	4	1					90		
PM Peak	15:00	12:00	14:00	12:00	12:00	14:00	13:00	12:00						12:00		
Vol.	5	11	9	9	11	9	4	1						51		

Stats

15th Percentile :	17 MPH
50th Percentile :	29 MPH
85th Percentile :	37 MPH
95th Percentile :	42 MPH
Mean Speed(Average) :	29 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	322
Percent in Pace :	42.1%
Number of Vehicles > 35 MPH :	208
Percent of Vehicles > 35 MPH :	27.2%



PRECISION
D A T A
INDUSTRIES, LLC

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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/ 18	0	0	1	1	0	0	0	0	0	0	0	0	0	2	27	25
01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1	23	22
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	1	3	0	0	0	0	0	0	0	0	0	0	4	23	21
04:00	1	0	0	1	0	2	0	0	0	0	0	0	0	4	37	27
05:00	0	2	5	0	2	0	1	0	1	0	0	0	0	11	40	27
06:00	0	5	0	1	5	7	1	1	1	0	0	0	0	21	38	32
07:00	1	3	1	4	15	8	6	0	0	0	0	0	0	38	39	32
08:00	1	7	4	9	5	6	5	0	0	0	0	0	0	37	38	28
09:00	2	4	1	10	5	3	1	1	0	0	0	0	0	27	35	27
10:00	1	4	7	3	12	6	3	1	0	0	0	0	0	37	37	29
11:00	1	4	1	8	7	2	1	0	0	0	0	0	0	24	33	27
12 PM	0	9	3	6	10	7	5	0	0	0	0	0	0	40	38	29
13:00	0	6	2	8	4	9	6	1	1	0	0	0	0	37	41	32
14:00	2	7	6	3	8	4	2	0	1	0	0	0	0	33	36	27
15:00	0	4	1	2	8	3	3	2	0	0	0	0	0	23	41	32
16:00	2	5	0	1	6	4	2	0	0	0	0	0	0	20	37	28
17:00	1	2	0	3	1	5	1	1	0	0	0	0	0	14	38	31
18:00	0	0	0	2	1	1	1	0	0	0	0	0	0	5	40	33
19:00	1	1	0	4	3	2	0	0	0	0	0	0	0	11	34	28
20:00	0	0	0	0	1	1	0	0	0	0	0	0	0	2	37	35
21:00	1	2	0	0	0	3	0	0	0	0	0	0	0	6	37	25
22:00	0	1	3	2	0	2	0	0	0	0	0	0	0	8	36	26
23:00	0	0	3	0	0	0	0	0	0	0	0	0	0	3	23	22
Total	14	67	42	68	93	75	38	7	4	0	0	0	0	408		
%	3.4%	16.4%	10.3%	16.7%	22.8%	18.4%	9.3%	1.7%	1.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	08:00	10:00	09:00	07:00	07:00	07:00	06:00	05:00					07:00		
Vol.	2	7	7	10	15	8	6	1	1					38		
PM Peak	14:00	12:00	14:00	13:00	12:00	13:00	13:00	15:00	13:00					12:00		
Vol.	2	9	6	8	10	9	6	2	1					40		

Stats

15th Percentile :	17 MPH
50th Percentile :	29 MPH
85th Percentile :	38 MPH
95th Percentile :	42 MPH
Mean Speed(Average) :	29 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	168
Percent in Pace :	41.2%
Number of Vehicles > 35 MPH :	109
Percent of Vehicles > 35 MPH :	26.7%



PRECISION
D A T A
INDUSTRIES, LLC

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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	18	17
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	18	17
04:00	0	4	3	1	0	0	0	0	1	0	0	0	0	9	27	24
05:00	0	4	3	0	1	2	1	2	0	0	0	0	0	13	44	29
06:00	1	4	4	1	7	8	5	0	1	0	0	0	0	31	40	31
07:00	1	1	3	8	4	5	4	2	0	0	0	0	0	28	41	31
08:00	1	4	2	1	3	4	2	2	0	0	0	0	0	19	41	30
09:00	0	3	0	2	4	10	2	0	0	0	0	0	0	21	38	33
10:00	1	7	5	6	5	4	1	1	1	0	0	0	0	31	36	27
11:00	0	2	1	2	9	1	1	0	0	0	0	0	0	16	33	30
12 PM	0	4	2	3	5	10	3	0	0	0	0	0	0	27	38	31
13:00	1	2	6	3	11	11	5	1	0	0	0	0	0	40	39	32
14:00	1	5	8	3	9	2	3	1	0	0	0	0	0	32	37	28
15:00	1	5	2	4	4	6	1	0	0	0	0	0	0	23	36	28
16:00	1	3	2	3	3	1	3	2	0	0	0	0	0	18	42	30
17:00	1	2	3	3	7	1	0	0	0	0	0	0	0	17	32	26
18:00	2	5	4	2	1	3	0	0	1	0	0	0	0	18	36	24
19:00	1	2	0	1	3	3	1	0	0	0	0	0	0	11	37	29
20:00	1	2	0	0	1	4	0	1	0	0	0	0	0	9	38	30
21:00	0	1	0	0	6	2	1	0	0	0	0	0	0	10	37	33
22:00	1	1	0	1	2	3	0	0	1	0	0	0	0	9	38	31
23:00	3	2	0	1	2	1	0	0	0	0	0	0	0	9	33	21
Total %	17 4.3%	65 16.5%	48 12.2%	45 11.4%	87 22.1%	82 20.8%	33 8.4%	12 3.0%	5 1.3%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	394		
AM Peak	06:00	10:00	10:00	07:00	11:00	09:00	06:00	05:00	04:00					06:00		
Vol.	1	7	5	8	9	10	5	2	1					31		
PM Peak	23:00	14:00	14:00	15:00	13:00	13:00	13:00	16:00	18:00					13:00		
Vol.	3	5	8	4	11	11	5	2	1					40		

Stats

15th Percentile :	17 MPH
50th Percentile :	30 MPH
85th Percentile :	38 MPH
95th Percentile :	43 MPH
Mean Speed(Average) :	29 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	169
Percent in Pace :	42.9%
Number of Vehicles > 35 MPH :	116
Percent of Vehicles > 35 MPH :	29.3%



PRECISION
D A T A
INDUSTRIES, LLC

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NB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	0	0	0	1	0	0	1	0	0	0	0	0	0	2	42	35
01:00	0	0	0	1	0	0	1	0	0	1	0	0	0	3	56	42
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	18	17
04:00	0	1	4	1	2	3	3	0	0	0	0	0	0	14	40	31
05:00	0	5	8	6	21	17	5	0	0	0	0	0	0	62	37	31
06:00	6	11	12	10	19	8	3	3	0	0	0	0	0	72	35	27
07:00	1	13	4	5	19	20	7	0	0	0	0	0	0	69	38	30
08:00	0	17	8	8	13	24	5	2	1	0	0	0	0	78	38	30
09:00	4	15	10	15	15	15	4	2	0	0	0	0	0	80	37	28
10:00	0	14	8	8	27	12	3	0	0	0	0	0	0	72	35	29
11:00	0	10	7	11	15	7	3	1	0	0	0	0	0	54	36	28
12 PM	2	14	29	6	12	14	4	1	0	0	0	0	0	82	36	26
13:00	1	10	10	6	11	12	6	0	0	0	0	0	0	56	38	29
14:00	1	11	11	6	7	10	1	1	0	0	0	0	0	48	36	27
15:00	1	8	4	9	7	3	2	0	2	0	0	0	0	36	36	28
16:00	2	2	2	3	8	4	0	1	0	0	0	0	0	22	36	28
17:00	1	4	2	3	4	4	3	0	0	0	0	0	0	21	38	29
18:00	1	2	1	2	6	5	1	0	0	0	0	0	0	18	37	30
19:00	0	1	3	0	5	1	0	1	0	0	0	0	0	11	35	30
20:00	0	3	4	0	0	0	0	0	0	0	0	0	0	7	22	20
21:00	0	1	2	0	1	4	0	0	0	0	0	0	0	8	37	30
22:00	1	1	0	2	1	0	0	0	0	0	0	0	0	5	30	22
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
Total	21	144	129	103	193	163	52	12	3	1	0	0	0	821		
%	2.6%	17.5%	15.7%	12.5%	23.5%	19.9%	6.3%	1.5%	0.4%	0.1%	0.0%	0.0%	0.0%			
AM Peak	06:00	08:00	06:00	09:00	10:00	08:00	07:00	06:00	08:00	01:00				09:00		
Vol.	6	17	12	15	27	24	7	3	1	1				80		
PM Peak	12:00	12:00	12:00	15:00	12:00	12:00	13:00	12:00	15:00					12:00		
Vol.	2	14	29	9	12	14	6	1	2					82		

Stats

15th Percentile :	17 MPH
50th Percentile :	29 MPH
85th Percentile :	37 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	28 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	356
Percent in Pace :	43.4%
Number of Vehicles > 35 MPH :	198
Percent of Vehicles > 35 MPH :	24.2%



PRECISION
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176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/10/ 18	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	2	0	0	0	0	0	0	0	0	0	0	2	23	22
04:00	0	1	4	2	2	1	1	0	0	0	0	0	0	11	35	27
05:00	0	5	4	9	17	19	5	3	0	0	0	0	0	62	38	32
06:00	3	8	9	10	17	20	1	0	0	0	0	0	0	68	36	29
07:00	1	17	14	4	18	17	7	1	0	0	0	0	0	79	37	29
08:00	0	17	8	10	15	19	5	1	0	0	0	0	0	75	37	29
09:00	2	17	21	10	23	24	0	2	0	0	0	0	0	99	36	28
10:00	0	6	7	10	14	15	7	1	0	0	0	0	0	60	38	31
11:00	1	10	6	5	8	4	4	0	0	0	0	0	0	38	36	27
12 PM	2	14	5	8	17	9	0	0	0	0	0	0	0	55	34	26
13:00	1	12	10	7	9	10	2	0	0	0	0	0	0	51	36	27
14:00	3	11	9	7	9	4	3	1	1	0	0	0	0	48	36	26
15:00	4	14	6	5	7	7	1	2	0	0	0	0	0	46	36	25
16:00	0	6	3	3	5	5	4	0	1	0	0	0	0	27	40	30
17:00	2	5	5	1	7	1	0	0	0	0	0	0	0	21	32	24
18:00	2	6	4	0	6	1	1	0	0	0	0	0	0	20	33	24
19:00	1	7	1	0	6	1	0	1	0	0	0	0	0	17	33	25
20:00	0	1	1	0	1	1	0	0	0	0	0	0	0	4	36	27
21:00	2	0	0	0	3	4	0	1	0	0	0	0	0	10	38	31
22:00	0	1	1	0	3	5	0	0	0	0	0	0	0	10	37	32
23:00	0	1	1	0	2	1	0	0	0	0	0	0	0	5	35	28
Total	24	159	121	91	189	169	41	13	2	0	0	0	0	809		
%	3.0%	19.7%	15.0%	11.2%	23.4%	20.9%	5.1%	1.6%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	07:00	09:00	06:00	09:00	09:00	07:00	05:00						09:00		
Vol.	3	17	21	10	23	24	7	3						99		
PM Peak	15:00	12:00	13:00	12:00	12:00	13:00	16:00	15:00	14:00					12:00		
Vol.	4	14	10	8	17	10	4	2	1					55		

Stats

15th Percentile : 17 MPH
50th Percentile : 29 MPH
85th Percentile : 37 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 28 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 358
Percent in Pace : 44.3%
Number of Vehicles > 35 MPH : 191
Percent of Vehicles > 35 MPH : 23.6%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
NB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	1	0	0	1	1	0	0	0	0	0	0	0	0	3	31	22
01:00	1	1	0	0	0	1	0	0	0	0	0	0	0	3	36	21
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	1	2	0	0	0	0	0	0	0	0	0	0	3	22	20
04:00	0	3	5	0	1	1	1	0	0	0	0	0	0	11	35	25
05:00	4	1	7	14	20	12	7	0	0	0	0	0	0	65	37	30
06:00	1	7	4	7	6	15	5	2	0	0	0	0	0	47	38	31
07:00	2	13	7	4	15	14	6	0	0	0	0	0	0	61	37	29
08:00	2	11	7	10	12	19	3	2	1	0	0	0	0	67	37	30
09:00	0	15	13	13	27	23	8	0	0	0	0	0	0	99	37	30
10:00	3	7	13	12	15	23	4	0	0	1	0	0	0	78	37	30
11:00	5	7	6	8	9	18	3	1	0	0	0	0	0	57	37	29
12 PM	0	5	7	6	17	16	9	2	0	0	0	0	0	62	39	32
13:00	0	4	4	10	19	13	7	2	1	0	0	0	0	60	39	33
14:00	7	6	8	7	16	12	7	1	0	0	0	0	0	64	38	28
15:00	1	7	10	2	11	6	2	1	1	0	0	0	0	41	37	28
16:00	0	7	6	3	2	4	3	1	0	0	0	0	0	26	39	28
17:00	3	2	2	4	7	8	1	0	0	0	0	0	0	27	37	29
18:00	2	1	2	3	3	2	2	0	0	0	0	0	0	15	38	27
19:00	0	1	2	2	3	4	3	0	0	0	0	0	0	15	40	32
20:00	0	0	1	0	3	1	0	0	0	0	0	0	0	5	35	31
21:00	0	0	0	2	0	4	2	0	0	0	0	0	0	8	41	36
22:00	0	0	1	1	3	4	2	0	0	0	0	0	0	11	39	34
23:00	2	0	1	2	0	1	0	0	0	0	0	0	0	6	34	21
Total	34	99	108	111	190	201	75	12	3	1	0	0	0	834		
%	4.1%	11.9%	12.9%	13.3%	22.8%	24.1%	9.0%	1.4%	0.4%	0.1%	0.0%	0.0%	0.0%			
AM Peak	11:00	09:00	09:00	05:00	09:00	09:00	09:00	06:00	08:00	10:00				09:00		
Vol.	5	15	13	14	27	23	8	2	1	1				99		
PM Peak	14:00	15:00	15:00	13:00	13:00	12:00	12:00	12:00	13:00					14:00		
Vol.	7	7	10	10	19	16	9	2	1					64		

Stats

15th Percentile : 18 MPH
50th Percentile : 30 MPH
85th Percentile : 38 MPH
95th Percentile : 42 MPH

Mean Speed(Average) : 30 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 391
Percent in Pace : 46.9%
Number of Vehicles > 35 MPH : 252
Percent of Vehicles > 35 MPH : 30.2%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/05/ 18	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
01:00	3	26	16	1	0	0	0	0	0	0	0	0	0	46	22	18
02:00	1	2	1	1	1	0	0	0	0	0	0	0	0	6	29	20
03:00	0	1	0	0	0	0	0	1	0	0	0	0	0	2	47	32
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	1	3	2	0	1	0	0	0	0	0	0	0	0	7	23	19
06:00	1	1	0	4	6	6	0	0	0	0	0	0	0	18	36	30
07:00	0	5	5	5	7	2	0	0	0	0	0	0	0	24	32	26
08:00	1	2	5	6	4	4	0	0	0	0	0	0	0	22	34	27
09:00	4	5	2	13	11	4	2	0	0	0	0	0	0	41	33	27
10:00	2	7	3	10	12	12	3	0	0	0	0	0	0	49	37	29
11:00	2	17	1	9	20	13	3	0	0	0	0	0	0	65	36	28
12 PM	4	15	5	13	21	9	2	0	0	0	0	0	0	69	34	27
13:00	1	11	3	13	21	15	5	0	0	0	0	0	0	69	37	30
14:00	2	18	14	18	18	18	7	0	0	0	0	0	0	95	36	28
15:00	2	26	1	8	15	14	5	1	0	0	0	0	0	72	37	27
16:00	0	16	2	3	4	12	6	3	0	0	0	0	0	46	40	30
17:00	0	10	2	7	16	9	6	0	0	0	0	0	0	50	38	30
18:00	2	8	1	7	13	12	3	0	0	0	0	0	0	46	37	29
19:00	1	5	1	7	5	4	0	0	0	0	0	0	0	23	34	27
20:00	1	5	2	5	5	0	1	0	0	0	0	0	0	19	32	25
21:00	1	4	0	1	1	1	3	0	0	0	0	0	0	11	41	27
22:00	0	0	0	9	4	6	1	1	0	1	0	0	0	22	38	34
23:00	0	6	3	0	4	1	0	0	0	0	0	0	0	14	32	24
Total	29	193	69	141	190	142	47	6	0	1	0	0	0	818		
%	3.5%	23.6%	8.4%	17.2%	23.2%	17.4%	5.7%	0.7%	0.0%	0.1%	0.0%	0.0%	0.0%			
AM Peak	09:00	01:00	01:00	09:00	11:00	11:00	10:00	03:00						11:00		
Vol.	4	26	16	13	20	13	3	1						65		
PM Peak	12:00	15:00	14:00	14:00	12:00	14:00	14:00	16:00		22:00				14:00		
Vol.	4	26	14	18	21	18	7	3		1				95		

Stats

15th Percentile :	16 MPH
50th Percentile :	28 MPH
85th Percentile :	36 MPH
95th Percentile :	40 MPH
Mean Speed(Average) :	27 MPH
10 MPH Pace Speed :	28-37 MPH
Number in Pace :	332
Percent in Pace :	40.6%
Number of Vehicles > 35 MPH :	168
Percent of Vehicles > 35 MPH :	20.5%



PRECISION
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INDUSTRIES, LLC

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SB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/06/18	0	2	0	0	0	0	0	0	0	0	0	0	0	2	18	17
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	18	17
02:00	1	22	18	0	1	1	0	0	0	0	0	0	0	43	22	20
03:00	0	8	0	0	0	0	0	0	0	0	0	0	0	8	18	17
04:00	0	1	0	0	2	0	0	0	0	0	0	0	0	3	32	27
05:00	3	3	0	3	1	0	0	0	0	0	0	0	0	10	28	19
06:00	1	1	1	1	6	5	2	0	0	1	0	0	0	18	39	33
07:00	1	2	4	5	11	6	1	0	0	0	0	0	0	30	36	29
08:00	2	0	6	6	7	7	3	1	0	0	0	0	0	32	38	30
09:00	4	5	3	7	7	8	1	0	1	0	0	0	0	36	36	27
10:00	5	8	4	10	17	9	0	0	0	0	0	0	0	53	34	27
11:00	1	10	5	19	14	15	1	0	0	0	0	0	0	65	36	28
12 PM	5	11	4	10	9	12	3	0	0	0	0	0	0	54	36	27
13:00	1	11	11	18	28	6	1	0	0	0	0	0	0	76	33	27
14:00	2	15	9	18	12	11	3	0	0	0	0	0	0	70	35	27
15:00	2	12	2	10	8	7	1	0	0	0	0	0	0	42	35	26
16:00	6	20	4	1	14	5	2	0	0	0	0	0	0	52	33	23
17:00	2	7	4	6	13	8	4	0	0	0	0	0	0	44	37	29
18:00	0	6	6	9	11	7	4	0	0	0	0	0	0	43	37	29
19:00	2	7	1	2	4	1	1	1	0	0	0	0	0	19	34	24
20:00	0	6	1	2	5	3	0	1	0	0	0	0	0	18	36	28
21:00	0	3	0	1	2	2	0	0	0	0	0	0	0	8	36	27
22:00	1	5	0	1	4	0	0	0	0	0	0	0	0	11	31	22
23:00	2	8	2	4	4	4	1	0	0	0	0	0	0	25	35	25
Total	41	174	85	133	180	117	28	3	1	1	0	0	0	763		
%	5.4%	22.8%	11.1%	17.4%	23.6%	15.3%	3.7%	0.4%	0.1%	0.1%	0.0%	0.0%	0.0%			
AM Peak	10:00	02:00	02:00	11:00	10:00	11:00	08:00	08:00	09:00	06:00				11:00		
Vol.	5	22	18	19	17	15	3	1	1	1				65		
PM Peak	16:00	16:00	13:00	13:00	13:00	12:00	17:00	19:00						13:00		
Vol.	6	20	11	18	28	12	4	1						76		

Stats

15th Percentile : 16 MPH
50th Percentile : 27 MPH
85th Percentile : 35 MPH
95th Percentile : 38 MPH

Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 25-34 MPH
Number in Pace : 313
Percent in Pace : 41.0%
Number of Vehicles > 35 MPH : 127
Percent of Vehicles > 35 MPH : 16.6%



PRECISION
D A T A
INDUSTRIES, LLC

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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/07/ 18	0	2	3	0	1	1	0	0	0	0	0	0	0	7	33	24
01:00	0	1	0	0	2	0	0	0	0	0	0	0	0	3	32	27
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2	18	17
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	1	0	0	0	1	0	0	0	0	0	0	0	2	37	27
06:00	2	1	1	4	0	3	4	0	0	0	0	0	0	15	41	29
07:00	0	3	0	3	2	0	0	1	0	0	0	0	0	9	33	27
08:00	1	4	1	2	2	4	0	0	0	0	0	0	0	14	36	26
09:00	0	4	2	1	3	1	0	1	0	0	0	0	0	12	34	27
10:00	0	6	2	3	8	9	4	2	0	0	0	0	0	34	40	32
11:00	3	9	2	5	9	2	1	0	0	0	0	0	0	31	33	24
12 PM	1	10	1	4	10	10	0	1	0	0	0	0	0	37	36	28
13:00	1	6	6	9	5	2	1	0	1	0	0	0	0	31	33	26
14:00	1	10	3	5	7	4	7	0	0	0	0	0	0	37	40	28
15:00	0	5	2	5	8	6	2	0	0	0	0	0	0	28	37	29
16:00	2	4	2	2	8	7	2	0	0	0	0	0	0	27	37	29
17:00	1	5	1	4	9	9	2	1	0	0	0	0	0	32	38	30
18:00	0	4	0	0	7	5	2	1	0	0	0	0	0	19	39	32
19:00	2	1	1	1	4	8	0	0	0	0	0	0	0	17	37	30
20:00	1	1	0	0	1	1	0	0	0	0	0	0	0	4	36	23
21:00	0	3	0	1	4	0	0	0	0	0	0	0	0	8	32	26
22:00	0	2	0	0	3	1	0	0	0	0	0	0	0	6	34	28
23:00	0	11	2	2	0	3	1	0	0	0	0	0	0	19	35	23
Total	15	95	29	51	93	77	26	7	1	0	0	0	0	394		
%	3.8%	24.1%	7.4%	12.9%	23.6%	19.5%	6.6%	1.8%	0.3%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	11:00	00:00	11:00	11:00	10:00	06:00	10:00						10:00		
Vol.	3	9	3	5	9	9	4	2						34		
PM Peak	16:00	23:00	13:00	13:00	12:00	12:00	14:00	12:00	13:00					12:00		
Vol.	2	11	6	9	10	10	7	1	1					37		

Stats

15th Percentile :	16 MPH
50th Percentile :	29 MPH
85th Percentile :	37 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	28 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	170
Percent in Pace :	43.1%
Number of Vehicles > 35 MPH :	96
Percent of Vehicles > 35 MPH :	24.3%



PRECISION
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SB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/08/ 18	0	2	1	1	0	2	2	0	0	0	0	0	0	8	41	30
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	1	38	37
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	1	3	0	0	0	0	0	0	0	0	0	0	0	4	18	15
05:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
06:00	2	2	2	0	1	2	0	0	0	0	0	0	0	9	35	22
07:00	0	1	0	3	1	1	0	0	0	0	0	0	0	6	34	28
08:00	1	2	2	2	2	0	0	0	0	0	0	0	0	9	30	23
09:00	0	3	3	0	9	3	1	0	0	0	0	0	0	19	35	29
10:00	1	5	2	2	3	7	0	0	0	0	0	0	0	20	36	27
11:00	2	4	1	4	11	5	0	0	0	0	0	0	0	27	34	28
12 PM	0	4	0	6	8	6	4	1	0	0	0	0	0	29	39	32
13:00	1	6	0	5	10	2	4	2	0	0	0	0	0	30	40	30
14:00	1	11	3	9	10	5	3	0	0	0	0	0	0	42	35	27
15:00	2	6	2	5	7	6	2	0	0	0	0	0	0	30	36	28
16:00	1	5	2	3	8	7	1	0	0	0	0	0	0	27	36	29
17:00	3	7	2	9	14	5	2	1	0	0	0	0	0	43	35	28
18:00	2	6	0	6	8	5	2	1	0	0	0	0	0	30	37	28
19:00	2	4	2	0	7	6	0	0	0	0	0	0	0	21	36	27
20:00	0	1	2	4	3	4	3	0	0	0	0	0	0	17	39	32
21:00	1	2	0	0	2	3	1	0	0	0	0	0	0	9	38	29
22:00	2	3	0	2	2	5	3	0	0	0	0	0	0	17	39	29
23:00	2	15	4	4	5	3	0	2	0	0	0	0	0	35	33	24
Total	24	92	28	66	112	78	28	7	0	0	0	0	0	435		
%	5.5%	21.1%	6.4%	15.2%	25.7%	17.9%	6.4%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	10:00	09:00	11:00	11:00	10:00	00:00							11:00		
Vol.	2	5	3	4	11	7	2							27		
PM Peak	17:00	23:00	23:00	14:00	17:00	16:00	12:00	13:00						17:00		
Vol.	3	15	4	9	14	7	4	2						43		

Stats

15th Percentile :	16 MPH
50th Percentile :	29 MPH
85th Percentile :	37 MPH
95th Percentile :	41 MPH
Mean Speed(Average) :	28 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	190
Percent in Pace :	43.7%
Number of Vehicles > 35 MPH :	97
Percent of Vehicles > 35 MPH :	22.4%



PRECISION
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176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/09/ 18	1	5	0	2	5	2	0	0	0	0	0	0	0	15	33	25
01:00	1	1	0	2	2	2	1	0	0	0	0	0	0	9	38	29
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	2	0	0	1	1	0	0	0	0	0	0	0	4	36	26
05:00	0	0	0	4	1	0	0	0	0	0	0	0	0	5	30	28
06:00	0	2	3	4	8	3	3	0	0	0	0	0	0	23	38	30
07:00	2	3	4	5	4	12	3	0	0	0	0	0	0	33	38	30
08:00	0	10	1	7	7	7	0	0	0	0	0	0	0	32	35	27
09:00	7	11	2	2	13	3	2	0	0	0	0	0	0	40	33	24
10:00	2	7	8	10	11	6	2	0	0	0	0	0	0	46	34	27
11:00	1	14	9	9	14	7	2	1	0	0	0	0	0	57	35	27
12 PM	5	11	3	13	12	6	1	0	1	0	0	0	0	52	34	26
13:00	2	13	6	11	14	10	6	3	0	0	0	0	0	65	38	29
14:00	1	14	6	9	25	22	3	0	1	0	0	0	0	81	37	30
15:00	1	22	5	10	8	13	4	2	0	0	0	0	0	65	37	27
16:00	2	15	1	11	16	7	4	0	0	0	0	0	0	56	35	27
17:00	1	6	4	9	15	13	2	1	0	0	0	0	0	51	37	30
18:00	3	10	5	6	13	11	3	1	0	0	0	0	0	52	37	28
19:00	0	9	2	3	6	2	0	0	0	0	0	0	0	22	32	25
20:00	0	8	0	5	5	2	0	0	0	0	0	0	0	20	32	25
21:00	2	5	1	4	3	2	0	0	1	0	0	0	0	18	34	25
22:00	0	2	0	3	0	1	1	2	0	0	0	0	0	9	45	32
23:00	1	8	3	1	1	0	1	0	0	0	0	0	0	15	27	21
Total	32	178	63	130	184	132	38	10	3	0	0	0	0	770		
%	4.2%	23.1%	8.2%	16.9%	23.9%	17.1%	4.9%	1.3%	0.4%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	11:00	11:00	10:00	11:00	07:00	06:00	11:00						11:00		
Vol.	7	14	9	10	14	12	3	1						57		
PM Peak	12:00	15:00	13:00	12:00	14:00	14:00	13:00	13:00	12:00					14:00		
Vol.	5	22	6	13	25	22	6	3	1					81		

Stats

15th Percentile : 16 MPH
50th Percentile : 28 MPH
85th Percentile : 36 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 30-39 MPH
Number in Pace : 316
Percent in Pace : 41.0%
Number of Vehicles > 35 MPH : 157
Percent of Vehicles > 35 MPH : 20.3%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed			
04/10/18	2	1	0	0	0	0	0	0	0	0	0	0	0	3	16	11			
01:00	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30			
02:00	0	1	0	0	0	0	1	0	0	0	0	0	0	2	42	30			
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*			
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*			
05:00	2	2	0	1	1	1	0	0	0	0	0	0	0	7	33	21			
06:00	1	2	0	4	5	4	0	0	0	0	0	0	0	16	36	29			
07:00	2	9	2	5	6	6	2	0	0	0	0	0	0	32	36	26			
08:00	1	8	5	4	10	3	0	1	0	0	0	0	0	32	33	26			
09:00	2	5	1	9	17	10	1	1	0	0	0	0	0	46	36	30			
10:00	4	10	4	13	18	7	2	1	0	0	0	0	0	59	34	27			
11:00	1	11	5	9	8	7	1	0	1	0	0	0	0	43	35	27			
12 PM	2	15	5	8	17	5	3	1	0	0	0	0	0	56	34	27			
13:00	3	9	4	12	21	11	2	1	0	0	0	0	0	63	36	29			
14:00	2	13	12	17	32	8	5	0	0	0	0	0	0	89	33	28			
15:00	6	11	7	13	19	10	5	0	0	0	0	0	0	71	36	27			
16:00	2	19	4	10	17	9	2	0	0	0	0	0	0	63	34	26			
17:00	2	7	2	6	18	12	8	0	0	0	0	0	0	55	38	31			
18:00	2	11	5	13	11	10	2	0	0	0	0	0	0	54	35	27			
19:00	4	11	1	2	5	4	3	1	0	0	0	0	0	31	38	25			
20:00	1	6	1	6	1	1	1	0	0	0	0	0	0	17	31	24			
21:00	1	6	1	2	2	3	0	1	0	0	0	0	0	16	36	25			
22:00	1	1	1	1	4	5	0	0	0	0	1	0	0	14	37	32			
23:00	2	9	3	1	3	2	1	0	0	0	0	0	0	21	33	23			
Total %	43 5.4%	167 21.1%	63 8.0%	137 17.3%	216 27.3%	118 14.9%	39 4.9%	7 0.9%	1 0.1%	0 0.0%	1 0.1%	0 0.0%	0 0.0%	792					
AM Peak	10:00	11:00	08:00	10:00	10:00	09:00	07:00	08:00	11:00								10:00		
Vol.	4	11	5	13	18	10	2	1	1								59		
PM Peak	15:00	16:00	14:00	14:00	14:00	17:00	17:00	12:00						22:00	14:00				
Vol.	6	19	12	17	32	12	8	1						1	89				

Stats

15th Percentile : 16 MPH
50th Percentile : 28 MPH
85th Percentile : 36 MPH
95th Percentile : 40 MPH

Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 25-34 MPH
Number in Pace : 353
Percent in Pace : 44.6%
Number of Vehicles > 35 MPH : 142
Percent of Vehicles > 35 MPH : 18.0%



PRECISION
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Hanscom Drive (Main entrance of Hanscom Field)
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Client: Fitzgerald & Halliday, Inc. / M.Morehouse
SB

176038 F Speed
Site Code: TBA

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
04/11/ 18	0	0	0	1	1	0	0	0	0	0	0	0	0	2	32	30
01:00	2	26	11	0	0	0	1	0	0	0	0	0	0	40	21	19
02:00	2	7	0	0	0	0	0	0	0	0	0	0	0	9	18	15
03:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3	18	17
04:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3	18	17
05:00	1	5	1	0	0	0	0	0	0	0	0	0	0	7	18	16
06:00	2	4	1	4	5	4	3	0	0	0	0	0	0	23	38	28
07:00	2	2	2	4	4	5	1	0	0	0	0	0	0	20	37	28
08:00	1	5	1	3	11	8	1	0	0	0	0	0	0	30	36	30
09:00	3	4	3	13	13	7	4	0	0	0	0	0	0	47	36	29
10:00	3	8	3	10	13	6	0	0	0	0	0	0	0	43	33	26
11:00	4	10	8	6	15	10	4	1	0	0	0	0	0	58	37	28
12 PM	2	11	2	14	16	13	2	0	0	0	0	0	0	60	36	28
13:00	3	14	4	9	24	8	1	1	0	0	0	0	0	64	34	27
14:00	3	18	10	26	24	12	7	0	0	0	0	0	0	100	35	28
15:00	2	19	2	19	20	15	5	0	0	0	0	0	0	82	36	28
16:00	4	15	3	8	9	8	2	0	0	0	0	0	0	49	35	25
17:00	3	6	0	9	15	8	3	1	0	0	0	0	0	45	37	29
18:00	1	12	3	7	14	14	1	0	0	0	0	0	0	52	36	28
19:00	1	12	2	6	5	9	2	0	0	0	0	0	0	37	37	27
20:00	0	2	2	2	8	5	1	0	0	0	0	0	0	20	37	31
21:00	0	3	3	4	3	1	1	1	0	0	0	0	0	16	36	28
22:00	0	1	4	0	1	4	2	0	0	0	0	0	0	12	39	31
23:00	0	10	2	3	4	0	0	0	0	0	0	0	0	19	30	22
Total	39	200	67	148	205	137	41	4	0	0	0	0	0	841		
%	4.6%	23.8%	8.0%	17.6%	24.4%	16.3%	4.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	01:00	01:00	09:00	11:00	11:00	09:00	11:00						11:00		
Vol.	4	26	11	13	15	10	4	1						58		
PM Peak	16:00	15:00	14:00	14:00	13:00	15:00	14:00	13:00						14:00		
Vol.	4	19	10	26	24	15	7	1						100		

Stats

15th Percentile : 16 MPH
50th Percentile : 27 MPH
85th Percentile : 36 MPH
95th Percentile : 39 MPH

Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 25-34 MPH
Number in Pace : 353
Percent in Pace : 42.0%
Number of Vehicles > 35 MPH : 155
Percent of Vehicles > 35 MPH : 18.4%



PRECISION
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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 F Volume
Site Code: TBA

Start Time	NB		SB		Combin ed		4/5/2018	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	Thu	
12:00	1	8	2	14	3	22		
12:15	1	19	0	17	1	36		
12:30	2	12	0	21	2	33		
12:45	0	4	12	51	0	29	120	
01:00	1	12	0	2	1	21		
01:15	1	17	2	11	3	28		
01:30	0	15	38	19	38	34		
01:45	0	2	16	60	6	46	129	
02:00	0	21	1	38	1	59		
02:15	0	11	2	17	2	28		
02:30	0	12	0	24	0	36		
02:45	0	0	3	47	3	19	142	
03:00	0	9	1	17	1	26		
03:15	0	18	0	13	0	31		
03:30	1	10	1	27	2	37		
03:45	1	2	6	43	0	21	115	
04:00	1	9	0	16	1	25		
04:15	2	4	0	14	2	18		
04:30	1	4	0	9	1	13		
04:45	3	7	3	20	0	10	66	
05:00	1	9	1	17	2	26		
05:15	15	10	0	13	15	23		
05:30	14	5	3	7	17	12		
05:45	27	57	8	32	3	21	82	
06:00	16	5	4	14	20	19		
06:15	22	4	3	11	25	15		
06:30	11	5	7	12	18	17		
06:45	13	62	4	18	4	13	64	
07:00	21	3	6	10	27	13		
07:15	11	6	4	6	15	12		
07:30	10	2	9	5	19	7		
07:45	12	54	1	12	17	3	35	
08:00	12	2	2	3	14	5		
08:15	16	0	6	3	22	3		
08:30	8	1	7	5	15	6		
08:45	21	57	3	6	28	11	25	
09:00	26	1	9	22	35	4		
09:15	15	2	11	2	26	4		
09:30	31	1	10	3	41	4		
09:45	22	94	4	8	33	7	19	
10:00	20	1	18	41	38	6		
10:15	19	1	13	5	32	10		
10:30	17	3	10	3	27	6		
10:45	18	74	4	9	26	9	31	
11:00	17	0	12	49	29	10		
11:15	18	0	15	3	33	3		
11:30	19	0	18	0	37	0		
11:45	20	74	2	2	40	3	16	
Total	487	308	282	536	769	844		
Percent	63.3%	36.5%	36.7%	63.5%				
Day Total		795		818		1613		
Peak	09:00	-	01:15	-	09:30	-	-	-
Vol.	94	-	69	-	144	-	169	-
P.H.F.	0.758	-	0.821	-	0.878	-	0.716	-



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Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 F Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/6/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Fri	
12:00	0		13		0		12		0	25		
12:15	0		12		0		18		0	30		
12:30	0		14		2		12		2	26		
12:45	0	0	12	51	0	2	12	54	0	24	105	
01:00	0		11		0		19		0	30		
01:15	0		7		1		11		1	18		
01:30	1		11		0		20		1	31		
01:45	0	1	14	43	0	1	26	76	0	40	119	
02:00	2		14		0		27		2	41		
02:15	4		11		1		12		5	23		
02:30	1		5		3		19		4	24		
02:45	0	7	12	42	39	43	12	70	39	24	112	
03:00	1		9		4		13		5	22		
03:15	0		11		2		10		2	21		
03:30	2		3		2		7		4	10		
03:45	2	5	9	32	0	8	12	42	2	21	74	
04:00	6		8		1		13		7	21		
04:15	1		4		0		21		1	25		
04:30	0		6		0		8		0	14		
04:45	4	11	4	22	2	3	10	52	6	14	74	
05:00	4		6		1		6		5	12		
05:15	7		8		1		13		8	21		
05:30	26		5		1		10		27	15		
05:45	23	60	6	25	7	10	15	44	30	21	69	
06:00	19		6		5		13		24	19		
06:15	17		4		4		12		21	16		
06:30	14		5		5		10		19	15		
06:45	16	66	3	18	4	18	8	43	20	11	61	
07:00	18		3		5		5		23	8		
07:15	17		5		10		5		27	10		
07:30	13		3		6		4		19	7		
07:45	20	68	3	14	9	30	5	19	29	8	33	
08:00	25		3		9		4		34	7		
08:15	23		2		7		2		30	4		
08:30	17		2		3		3		20	5		
08:45	25	90	2	9	13	32	9	18	38	11	27	
09:00	22		0		8		3		30	3		
09:15	31		1		13		1		44	2		
09:30	14		1		10		3		24	4		
09:45	13	80	0	2	5	36	1	8	18	1	10	
10:00	13		2		16		3		29	5		
10:15	14		2		13		2		27	4		
10:30	15		3		18		5		33	8		
10:45	14	56	0	7	6	53	1	11	20	1	18	
11:00	14		0		19		9		33	9		
11:15	16		0		15		6		31	6		
11:30	8		2		12		3		20	5		
11:45	13	51	2	4	19	65	7	25	32	9	29	
Total	495		269		301		462		796	731		
Percent	62.2%		36.8%		37.8%		63.2%					
Day Total		764			763				1527			
Peak	08:30	-	12:00	-	11:00	-	01:30	-	08:45	-	01:30	-
Vol.	95	-	51	-	65	-	85	-	136	-	135	-
P.H.F.	0.766		0.911		0.855		0.787		0.773		0.823	



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176038 F Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/7/2018	
Time	A.M.		P.M.		A.M.		P.M.		A.M.	P.M.	Sat	
12:00	1		20		3		15		4	35		
12:15	1		6		1		4		2	10		
12:30	0		5		3		11		3	16		
12:45	0	2	9	40	0	7	7	37	0	9	16	77
01:00	0		6		0		11		0	17		
01:15	1		9		1		8		2	17		
01:30	0		8		1		6		1	14		
01:45	0	1	14	37	1	3	6	31	1	4	20	68
02:00	0		8		0		8		0	16		
02:15	0		9		0		9		0	18		
02:30	0		10		0		11		0	21		
02:45	0	0	6	33	0	0	9	37	0	0	15	70
03:00	0		7		0		9		0	16		
03:15	0		6		1		6		1	12		
03:30	3		6		1		8		4	14		
03:45	1	4	4	23	0	2	5	28	1	6	9	51
04:00	0		4		0		3		0	7		
04:15	1		8		0		7		1	15		
04:30	1		5		0		12		1	17		
04:45	2	4	3	20	0	0	5	27	2	4	8	47
05:00	1		3		1		5		2	8		
05:15	1		4		0		4		1	8		
05:30	2		4		1		9		3	13		
05:45	7	11	3	14	0	2	14	32	7	13	17	46
06:00	2		0		2		4		4	4		
06:15	8		2		3		7		11	9		
06:30	6		1		6		4		12	5		
06:45	5	21	2	5	4	15	4	19	9	36	6	24
07:00	5		4		5		3		10	7		
07:15	10		2		1		7		11	9		
07:30	10		5		2		6		12	11		
07:45	13	38	0	11	1	9	1	17	14	47	1	28
08:00	8		0		2		0		10	0		
08:15	10		2		5		3		15	5		
08:30	9		0		5		1		14	1		
08:45	10	37	0	2	2	14	0	4	12	51	0	6
09:00	4		1		2		1		6	2		
09:15	4		3		2		0		6	3		
09:30	7		1		4		5		11	6		
09:45	12	27	1	6	4	12	2	8	16	39	3	14
10:00	13		1		5		1		18	2		
10:15	9		4		8		2		17	6		
10:30	9		1		12		3		21	4		
10:45	6	37	2	8	9	34	0	6	15	71	2	14
11:00	2		1		11		9		13	10		
11:15	3		2		2		3		5	5		
11:30	9		0		8		3		17	3		
11:45	10	24	0	3	10	31	4	19	20	55	4	22
Total	206		202		129		265		335		467	
Percent	61.5%		43.3%		38.5%		56.7%					
Day Total		408				394				802		
Peak	09:45	-	01:45	-	10:15	-	02:15	-	09:45	-	12:00	-
Vol.	43	-	41	-	40	-	38	-	72	-	77	-
P.H.F.	0.827		0.732		0.833		0.864		0.857		0.550	



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 F Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/8/2018		
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Sun
12:00	0		5		3		7		3		12		
12:15	0		5		0		7		0		12		
12:30	1		9		3		6		4		15		
12:45	0	1	8	27	2	8	9	29	2	9	17	56	
01:00	0		4		0		11		0		15		
01:15	0		7		0		8		0		15		
01:30	0		14		0		8		0		22		
01:45	0	0	15	40	1	1	3	30	1	1	18	70	
02:00	0		12		0		12		0		24		
02:15	1		5		0		5		1		10		
02:30	0		9		0		13		0		22		
02:45	0	1	6	32	0	0	12	42	0	1	18	74	
03:00	0		6		0		10		0		16		
03:15	0		5		0		4		0		9		
03:30	1		3		0		8		1		11		
03:45	0	1	9	23	0	0	8	30	0	1	17	53	
04:00	3		0		2		2		5		2		
04:15	1		6		1		5		2		11		
04:30	1		3		0		10		1		13		
04:45	4	9	9	18	1	4	10	27	5	13	19	45	
05:00	0		4		0		12		0		16		
05:15	4		3		0		14		4		17		
05:30	4		7		0		14		4		21		
05:45	5	13	3	17	2	2	3	43	7	15	6	60	
06:00	4		4		3		6		7		10		
06:15	11		6		2		8		13		14		
06:30	4		5		3		10		7		15		
06:45	12	31	3	18	1	9	6	30	13	40	9	48	
07:00	2		2		1		6		3		8		
07:15	10		2		3		3		13		5		
07:30	4		4		1		6		5		10		
07:45	12	28	3	11	1	6	6	21	13	34	9	32	
08:00	3		3		0		7		3		10		
08:15	8		2		2		3		10		5		
08:30	3		2		4		3		7		5		
08:45	5	19	2	9	3	9	4	17	8	28	6	26	
09:00	1		2		6		4		7		6		
09:15	4		3		3		1		7		4		
09:30	7		3		2		4		9		7		
09:45	9	21	2	10	8	19	0	9	17	40	2	19	
10:00	10		2		1		3		11		5		
10:15	5		3		6		10		11		13		
10:30	8		3		2		3		10		6		
10:45	8	31	1	9	11	20	1	17	19	51	2	26	
11:00	6		1		7		13		13		14		
11:15	2		3		7		6		9		9		
11:30	4		2		4		7		8		9		
11:45	4	16	3	9	9	27	9	35	13	43	12	44	
Total	171		223		105		330		276		553		
Percent	62.0%		40.3%		38.0%		59.7%						
Day Total			394				435				829		
Peak	09:45	-	01:15	-	10:45	-	04:45	-	10:15	-	01:15	-	-
Vol.	32	-	48	-	29	-	50	-	53	-	79	-	-
P.H.F.	0.667		0.800		0.659		0.893		0.697		0.823		



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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 F Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/9/2018		
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Mon
12:00	1		14		2		15		3		29		
12:15	1		13		5		12		6		25		
12:30	0		29		3		13		3		42		
12:45	0	2	26	82	5	15	12	52	5	17	38	134	
01:00	0		12		3		21		3		33		
01:15	2		9		3		10		5		19		
01:30	1		19		1		17		2		36		
01:45	0	3	16	56	2	9	17	65	2	12	33	121	
02:00	0		10		0		38		0		48		
02:15	0		13		0		10		0		23		
02:30	0		8		0		21		0		29		
02:45	0	0	17	48	0	0	12	81	0	0	29	129	
03:00	0		12		0		22		0		34		
03:15	0		9		0		11		0		20		
03:30	0		5		0		10		0		15		
03:45	1	1	10	36	0	0	22	65	1	1	32	101	
04:00	2		9		0		14		2		23		
04:15	5		3		1		14		6		17		
04:30	5		7		1		14		6		21		
04:45	2	14	3	22	2	4	14	56	4	18	17	78	
05:00	2		2		1		12		3		14		
05:15	12		6		0		10		12		16		
05:30	22		3		2		12		24		15		
05:45	26	62	10	21	2	5	17	51	28	67	27	72	
06:00	19		4		5		8		24		12		
06:15	27		4		6		18		33		22		
06:30	9		5		6		16		15		21		
06:45	17	72	5	18	6	23	10	52	23	95	15	70	
07:00	21		3		6		8		27		11		
07:15	16		4		2		4		18		8		
07:30	18		1		19		5		37		6		
07:45	14	69	3	11	6	33	5	22	20	102	8	33	
08:00	12		4		7		9		19		13		
08:15	23		1		16		4		39		5		
08:30	19		2		7		6		26		8		
08:45	24	78	0	7	2	32	1	20	26	110	1	27	
09:00	18		1		7		6		25		7		
09:15	21		3		10		2		31		5		
09:30	19		2		10		5		29		7		
09:45	22	80	2	8	13	40	5	18	35	120	7	26	
10:00	17		2		11		3		28		5		
10:15	23		0		14		2		37		2		
10:30	16		3		13		3		29		6		
10:45	16	72	0	5	8	46	1	9	24	118	1	14	
11:00	16		0		22		7		38		7		
11:15	11		0		12		7		23		7		
11:30	11		0		14		1		25		1		
11:45	16	54	0	0	9	57	0	15	25	111	0	15	
Total	507		314		264		506		771		820		
Percent	65.8%		38.3%		34.2%		61.7%						
Day Total			821				770				1591		
Peak	05:30	-	12:00	-	10:15	-	01:45	-	09:30	-	01:30	-	-
Vol.	94	-	82	-	57	-	86	-	129	-	140	-	-
P.H.F.	0.870		0.707		0.648		0.566		0.872		0.729		



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Hanscom Drive (Main entrance of Hanscom Field)
north of Old Bedford Road
City, State: Lincoln, MA
Client: Fitzgerald & Halliday, Inc. / M.Morehouse

176038 F Volume
Site Code: TBA

Start	NB				SB				Combin ed		4/10/201 8 Tue	
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.	
12:00	0		13		1		10		1		23	
12:15	1		16		1		14		2		30	
12:30	0		9		0		10		0		19	
12:45	0	1	17	55	1	3	22	56	1	4	39	111
01:00	0		10		0		14		0		24	
01:15	0		19		0		15		0		34	
01:30	0		8		2		15		2		23	
01:45	0	0	14	51	0	2	19	63	0	2	33	114
02:00	0		14		0		41		0		55	
02:15	0		16		0		9		0		25	
02:30	0		10		1		21		1		31	
02:45	0	0	8	48	1	2	18	89	1	2	26	137
03:00	0		9		0		19		0		28	
03:15	0		13		0		17		0		30	
03:30	1		16		0		16		1		32	
03:45	1	2	8	46	0	0	19	71	1	2	27	117
04:00	1		7		0		20		1		27	
04:15	2		8		0		22		2		30	
04:30	2		7		0		8		2		15	
04:45	6	11	5	27	0	0	13	63	6	11	18	90
05:00	6		8		0		18		6		26	
05:15	14		7		0		11		14		18	
05:30	21		2		4		11		25		13	
05:45	21	62	4	21	3	7	15	55	24	69	19	76
06:00	20		7		6		16		26		23	
06:15	13		4		3		12		16		16	
06:30	19		6		3		17		22		23	
06:45	16	68	3	20	4	16	9	54	20	84	12	74
07:00	21		4		4		11		25		15	
07:15	21		5		8		7		29		12	
07:30	13		4		14		5		27		9	
07:45	24	79	4	17	6	32	8	31	30	111	12	48
08:00	11		1		3		5		14		6	
08:15	14		1		7		4		21		5	
08:30	23		1		12		8		35		9	
08:45	27	75	1	4	10	32	0	17	37	107	1	21
09:00	24		3		9		5		33		8	
09:15	23		2		8		3		31		5	
09:30	23		1		13		6		36		7	
09:45	29	99	4	10	16	46	2	16	45	145	6	26
10:00	15		3		25		3		40		6	
10:15	10		1		6		1		16		2	
10:30	17		3		14		4		31		7	
10:45	18	60	3	10	14	59	6	14	32	119	9	24
11:00	7		1		12		11		19		12	
11:15	9		1		7		7		16		8	
11:30	12		3		9		2		21		5	
11:45	10	38	0	5	15	43	1	21	25	81	1	26
Total	495		314		242		550		737		864	
Percent	67.2%		36.3%		32.8%		63.7%					
Day Total		809				792				1601		
Peak	09:00	-	12:00	-	09:15	-	01:15	-	09:15	-	01:15	-
Vol.	99	-	55	-	62	-	90	-	152	-	145	-
P.H.F.	0.853		0.809		0.620		0.549		0.844		0.659	



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176038 F Volume
Site Code: TBA

Start	NB				SB				Combin		4/11/201	
Time	A.M.		P.M.		A.M.	P.M.			A.M.	P.M.	8	Wed
12:00	2		10		2	19			4	29		
12:15	0		19		0	13			0	32		
12:30	1		9		0	9			1	18		
12:45	0	3	24	62	0	19	60		0	43	122	
01:00	0		20		0	20			0	40		
01:15	3		11		3	10			6	21		
01:30	0		14		0	12			0	26		
01:45	0	3	15	60	37	40	22	64	37	43	37	124
02:00	0		13		7	41			7	54		
02:15	0		18		1	16			1	34		
02:30	0		18		1	28			1	46		
02:45	0	0	15	64	0	15	100		0	30	164	
03:00	0		13		0	22			0	35		
03:15	0		11		1	19			1	30		
03:30	1		9		0	14			1	23		
03:45	2	3	8	41	2	3	27	82	4	35	123	
04:00	0		11		3	14			3	25		
04:15	1		9		0	7			1	16		
04:30	3		4		0	15			3	19		
04:45	7	11	2	26	0	3	13	49	7	15	75	
05:00	2		9		1	12			3	21		
05:15	11		7		3	7			14	14		
05:30	14		6		1	16			15	22		
05:45	38	65	5	27	2	7	10	45	40	72	15	72
06:00	14		2		6	13			20	15		
06:15	9		5		3	13			12	18		
06:30	13		3		3	11			16	14		
06:45	11	47	5	15	11	23	15	52	22	70	20	67
07:00	21		5		2	8			23	13		
07:15	12		3		5	13			17	16		
07:30	13		4		4	6			17	10		
07:45	15	61	3	15	9	20	10	37	24	81	13	52
08:00	15		2		7	3			22	5		
08:15	15		1		7	6			22	7		
08:30	13		0		9	3			22	3		
08:45	24	67	2	5	7	30	8	20	31	97	10	25
09:00	16		0		8	3			24	3		
09:15	37		2		12	1			49	3		
09:30	21		3		13	6			34	9		
09:45	25	99	3	8	14	47	6	16	39	146	9	24
10:00	11		1		17	3			28	4		
10:15	26		1		9	1			35	2		
10:30	28		4		9	3			37	7		
10:45	13	78	5	11	8	43	5	12	21	121	10	23
11:00	15		0		15	6			30	6		
11:15	13		4		15	8			28	12		
11:30	12		1		13	2			25	3		
11:45	17	57	1	6	15	58	3	19	32	115	4	25
Total	494		340		285	556			779	896		
Percent	63.4%		37.9%		36.6%	62.1%						
Day Total		834				841				1675		
Peak	09:00	-	00:15	-	11:00	-	01:45	-	09:15	-	01:45	-
Vol.	99	-	72	-	58	-	107	-	150	-	171	-
P.H.F.	0.669		0.750		0.853		0.652		0.765		0.792	

Appendix C-4

2018 Vehicle Occupancy Survey

Hanscom Drive AM Vehicle Occupancy Counts

Date: 4/5/2018
Time: 6:00 AM - 9:00 AM
Major Street: N/S: Hanscom Drive
Minor Street: E/W: Old Bedford Road
City, State: Lexington, MA

	Entering Hanscom Drive from South				Exiting Hanscom Drive from South			
Start Time	1	2	3+	Total	1	2	3+	Total
6:00 AM	14	0	0	14	3	1	0	4
6:15 AM	16	3	0	19	2	1	0	3
6:30 AM	11	0	0	11	6	1	0	7
6:45 AM	11	0	2	13	3	0	1	4
7:00 AM	19	1	0	20	5	0	1	6
7:15 AM	9	1	0	10	3	0	0	3
7:30 AM	9	0	1	10	8	0	1	9
7:45 AM	13	0	0	13	5	0	0	5
8:00 AM	11	2	0	13	3	0	0	3
8:15 AM	13	1	0	14	2	2	0	4
8:30 AM	9	0	0	9	5	0	1	6
8:45 AM	15	1	3	19	6	1	1	8
Total Vehicles	150	9	6	165	51	6	5	62
Total Passengers	150	18	18	186	51	12	15	78
VOR	1.13				1.26			
	1.16							

Date: 4/4/2018
Time: 3:00 PM - 6:00 PM
Major Street: N/S: Hanscom Drive
Minor Street: E/W: Old Bedford Road
City, State: Lexington, MA

	Entering Hanscom Drive from South				Exiting Hanscom Drive from North			
Start Time	1	2	3+	Total	1	2	3+	Total
3:00 PM	1	1	1	3	7	2	2	11
3:15 PM	6	0	0	6	12	0	0	12
3:30 PM	4	2	0	6	15	0	0	15
3:45 PM	4	2	1	7	6	2	1	9
4:00 PM	7	4	1	12	12	2	0	14
4:15 PM	7	2	1	10	7	4	0	11
4:30 PM	2	1	0	3	8	2	0	10
4:45 PM	4	2	0	6	5	2	0	7
5:00 PM	2	0	0	2	15	1	1	17
5:15 PM	2	0	0	2	7	3	0	10
5:30 PM	4	1	0	5	7	0	1	8
5:45 PM	2	2	0	4	12	1	0	13
Total Vehicles	45	17	4	66	113	19	5	137
Total Passengers	45	34	12	91	113	38	15	166
VOR	1.38				1.21			
	1.27							

Hanscom Drive Total Vehicle Occupancy Counts

		Entering Hanscom Drive from South				Exiting Hanscom Drive From South			
Start Time		1	2	3+	Total	1	2	3+	Total
AM	Total Vehicles	150	9	6	165	51	6	5	62
	Total Passengers	150	18	18	186	51	12	15	78
	VOR	1.13				1.26			
		1.16							
PM	Total Vehicles	45	17	4	66	113	19	5	137
	Total Passengers	45	34	12	91	113	38	15	166
	VOR	1.38				1.21			
		1.27							
Total	Total Vehicles	195	26	10	231	164	25	10	199
	Total Passengers	195	52	30	277	164	50	30	244
	VOR	1.20				1.23			
		1.21							

Appendix C-5

2018 Parking Survey Counts

Hanscom Field Parking Survey Count

Date: 4/4/2018

Time: 11:00 A.M – 1:00 P.M.

2005 GLP No.	Facility	Number of Parking Spaces				Comments
		2000	2005	2012	2018	
1	Hanger 1	37	37	37	37*	11 spaces not striped
2	Hanger 2	20	20	20	22*	
3	Hanger 3	22	22	20	20*	
7	Field Maintenance Building	18	18	18	18*	5 spaces not striped
8	Air Traffic Control Tower	93	107	107	105*	16 spaces not striped, 4 vehicles in unmarked spaces
9	Storage Building	n/a	n/a	18	18*	
9A	Sand Storage Building	n/a	0	0	0*	
10	Hanger 10	64	64	64	37	35 vacant spaces
11	Hanger 11	34	34	34	11	6 vacant spaces
11A	Hanger 11A	25	25	25	18	5 vacant spaces, 1 vehicle in an unmarked space
12	Hanger 12	12	12	12	12	9 vacant spaces
12A	Hanger 12A	57	57	57	n/a	Under construction
13	Hanger 13	12	15	15	14	1 vacant space, 3 vehicles in unmarked spaces
14	FBO Facility	10	10	10	10	2 vacant spaces, 1 vehicle in an unmarked space
15	Civil Air Terminal Building	701	667	667	444	222 vacant spaces, 18 spaces with snow
16	Hanger 16	11	45	45	45	28 vacant spaces
17	Hanger 17	25	25	25	31	21 vacant spaces
20	Maintenance Building	23	23	23	0	No striped spaces, 2 vehicles parked
21	Hanger 21	142	142	142	178	72 vacant spaces, dumpster in 1 space
22	FBO Garage and Fuel Farm	0	0	0	5*	
23	Draper Lab	n/a	17	17	17*	No striped spaces
24	Hanger 24	42	42	70	97	41 vacant spaces, 5 spaces had snow
25	Draper Lab	26	26	26	26*	Spaces not striped, observed from outside fence
30	Customs Trailer	0	5	5	5*	Spaces not striped
31	T-Hanger Row A	12	12	12	0	Spaces not striped, no vehicles observed
32	T-Hanger Row B	12	12	12	0	Spaces not striped, no vehicles observed
33	T-Hanger Row C	12	12	12	0	Spaces not striped, no vehicles observed
34	T-Hanger Row D	12	12	12	0	Spaces not striped, no vehicles observed
35	T-Hanger Row E	12	12	12	0	Spaces not striped, no vehicles observed
36	T-Hanger Row F	12	12	12	0	Spaces not striped, no vehicles observed
37	T-Hanger Row G	8	8	8	17*	Spaces not at building, but at entrance to hangers
38	T-Hanger Row H	12	12	12	0*	No striped spaces
39	T-Hanger Row J	18	18	18	0*	No striped spaces
New Lot	At Entrance	n/a	n/a	n/a	77	46 vacant spaces
Total		1484	1523	1567	974	

* = Could not access, parking spaces from Google Earth

Appendix C-6

SYNCRO Level of Service Analysis: 2018

Intersection												
Int Delay, s/veh	10.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↑	↔		↔↑			↔			↑	↔
Traffic Vol, veh/h	17	211	117	0	13	5	138	44	0	5	21	6
Future Vol, veh/h	17	211	117	0	13	5	138	44	0	5	21	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	58	85	83	25	65	100	87	84	39	33	53	42
Heavy Vehicles, %	0	1	1	0	1	1	0	4	0	0	2	2
Mvmt Flow	29	248	141	0	20	5	159	52	0	15	40	14
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	453	440	40	-	440	52	40	0	-	52	0	0
Stage 1	70	70	-	-	370	-	-	-	-	-	-	-
Stage 2	383	370	-	-	70	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.51	6.21	-	6.51	6.21	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.009	3.309	-	4.009	3.309	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	520	513	1034	0	513	1019	1583	-	0	1567	-	-
Stage 1	945	839	-	0	622	-	-	-	0	-	-	-
Stage 2	644	622	-	0	839	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	458	456	1034	-	456	1019	1583	-	-	1567	-	-
Mov Cap-2 Maneuver	458	456	-	-	456	-	-	-	-	-	-	-
Stage 1	848	831	-	-	558	-	-	-	-	-	-	-
Stage 2	554	558	-	-	831	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	13.9			12.2			5.7			1.6		
HCM LOS	B			B								
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1583	-	456	456	1034	456	559	1567	-	-		
HCM Lane V/C Ratio	0.1	-	0.336	0.272	0.136	0.022	0.027	0.01	-	-		
HCM Control Delay (s)	7.5	0	16.8	15.8	9	13.1	11.6	7.3	-	-		
HCM Lane LOS	A	A	C	C	A	B	B	A	-	-		
HCM 95th %tile Q(veh)	0.3	-	1.5	1.1	0.5	0.1	0.1	0	-	-		

Intersection						
Int Delay, s/veh	79.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	308	895	438	320	110	141
Future Vol, veh/h	308	895	438	320	110	141
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	86	92	95	84	83	81
Heavy Vehicles, %	1	1	5	3	3	2
Mvmt Flow	358	973	461	381	133	174
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	461	0	-	0	2150	461
Stage 1	-	-	-	-	461	-
Stage 2	-	-	-	-	1689	-
Critical Hdwy	4.11	-	-	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.209	-	-	-	3.527	3.318
Pot Cap-1 Maneuver	1105	-	-	-	~ 53	600
Stage 1	-	-	-	-	633	-
Stage 2	-	-	-	-	163	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1105	-	-	-	~ 36	600
Mov Cap-2 Maneuver	-	-	-	-	~ 36	-
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	163	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.6	0		\$ 628.4		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1105	-	-	-	36	600
HCM Lane V/C Ratio	0.324	-	-	-	3.681	0.29
HCM Control Delay (s)	9.8	-	-	-	\$ 1436.1	13.4
HCM Lane LOS	A	-	-	-	F	B
HCM 95th %tile Q(veh)	1.4	-	-	-	15.3	1.2
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	3.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	29	173	228	140	320
Future Vol, veh/h	40	29	173	228	140	320
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	50	89	86	94	91
Heavy Vehicles, %	10	7	1	1	0	2
Mvmt Flow	62	58	194	265	149	352
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	977	327	0	0	459	0
Stage 1	327	-	-	-	-	-
Stage 2	650	-	-	-	-	-
Critical Hdwy	6.5	6.27	-	-	4.1	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.363	-	-	2.2	-
Pot Cap-1 Maneuver	269	703	-	-	1113	-
Stage 1	713	-	-	-	-	-
Stage 2	505	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	224	703	-	-	1113	-
Mov Cap-2 Maneuver	224	-	-	-	-	-
Stage 1	595	-	-	-	-	-
Stage 2	505	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	21.6	0		2.6		
HCM LOS	C					
Minor Lane/Major Mvmt		NBT	NBRWBLn1	SBL	SBT	
Capacity (veh/h)		-	-	335	1113	-
HCM Lane V/C Ratio		-	-	0.357	0.134	-
HCM Control Delay (s)		-	-	21.6	8.7	0
HCM Lane LOS		-	-	C	A	A
HCM 95th %tile Q(veh)		-	-	1.6	0.5	-

Intersection												
Int Delay, s/veh	7.2											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	182	0	0	0	0	0	0	0	0	115	0
Future Vol, veh/h	0	182	0	0	0	0	0	0	0	0	115	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	86	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	7	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	212	0	0	0	0	0	0	0	0	134	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	134	-	-	134	-	-	0	-	-	-	0
Stage 1	-	0	-	-	134	-	-	-	-	-	-	-
Stage 2	-	134	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.57	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.063	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	748	0	0	757	0	0	-	0	0	-	0
Stage 1	0	-	0	0	785	0	0	-	0	0	-	0
Stage 2	0	776	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	748	-	-	757	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	748	-	-	757	-	-	-	-	-	-	-
Stage 1	-	-	-	-	785	-	-	-	-	-	-	-
Stage 2	-	776	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	11.7		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	- 748		-		-							
HCM Lane V/C Ratio	- 0.283		-		-							
HCM Control Delay (s)	- 11.7		0		-							
HCM Lane LOS	- B		A		-							
HCM 95th %tile Q(veh)	- 1.2		-		-							

Intersection												
Int Delay, s/veh	7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	215	0	0	0	0	0	0	0	0	115	0
Future Vol, veh/h	0	215	0	0	0	0	0	0	0	0	115	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	85	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	0	2	2	2	2	2	2	2	2	7	2
Mvmt Flow	0	253	0	0	0	0	0	0	0	0	134	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	134	-	-	134	-	-	0	-	-	-	0
Stage 1	-	134	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	134	-	-	-	-	-	-	-
Critical Hdwy	-	6.5	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	760	0	0	757	0	0	-	0	0	-	0
Stage 1	0	789	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	785	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	760	-	-	757	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	760	-	-	757	-	-	-	-	-	-	-
Stage 1	-	789	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	785	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10.7		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1 EBLn2WBLn1WBLn2		SBT									
Capacity (veh/h)	- 760 760		- - -									
HCM Lane V/C Ratio	- 0.166 0.166		- - -									
HCM Control Delay (s)	- 10.7 10.7		0 0									
HCM Lane LOS	- B B		A A									
HCM 95th %tile Q(veh)	- 0.6 0.6		- - -									

Intersection						
Int Delay, s/veh	9.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	215	0	0	0	0	452
Future Vol, veh/h	215	0	0	0	0	452
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	92	92	92	92	85
Heavy Vehicles, %	0	2	2	2	2	2
Mvmt Flow	253	0	0	0	0	532
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	127
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	900
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	900
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		14.6	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1		EBT	WBT		
Capacity (veh/h)	900		-	-		
HCM Lane V/C Ratio	0.591		-	-		
HCM Control Delay (s)	14.6		-	-		
HCM Lane LOS	B		-	-		
HCM 95th %tile Q(veh)	4		-	-		

Intersection												
Int Delay, s/veh	8.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↗			↗	↗
Traffic Vol, veh/h	6	13	151	0	215	1	105	21	0	1	44	22
Future Vol, veh/h	6	13	151	0	215	1	105	21	0	1	44	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	81	78	97	90	25	90	57	39	25	62	50
Heavy Vehicles, %	0	8	0	0	1	0	0	13	0	0	6	0
Mvmt Flow	10	16	194	0	239	4	117	37	0	4	71	44
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	472	350	71	-	350	37	71	0	-	37	0	0
Stage 1	79	79	-	-	271	-	-	-	-	-	-	-
Stage 2	393	271	-	-	79	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.58	6.2	-	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.072	3.3	-	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	506	565	997	0	576	1041	1542	-	0	1587	-	-
Stage 1	935	818	-	0	687	-	-	-	0	-	-	-
Stage 2	636	674	-	0	831	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	308	520	997	-	530	1041	1542	-	-	1587	-	-
Mov Cap-2 Maneuver	308	520	-	-	530	-	-	-	-	-	-	-
Stage 1	863	816	-	-	634	-	-	-	-	-	-	-
Stage 2	364	622	-	-	829	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10		13.7		5.7		0.2					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1542	-	379	520	997	530	539	1587	-	-		
HCM Lane V/C Ratio	0.076	-	0.046	0.015	0.194	0.225	0.229	0.003	-	-		
HCM Control Delay (s)	7.5	0	15	12	9.5	13.8	13.7	7.3	-	-		
HCM Lane LOS	A	A	C	B	A	B	B	A	-	-		
HCM 95th %tile Q(veh)	0.2	-	0.1	0	0.7	0.9	0.9	0	-	-		

Intersection						
Int Delay, s/veh	151.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	66	299	1044	173	225	323
Future Vol, veh/h	66	299	1044	173	225	323
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	83	95	79	79	90
Heavy Vehicles, %	0	3	1	1	2	0
Mvmt Flow	90	360	1099	219	285	359
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	1099	0	-	0	1639	1099
Stage 1	-	-	-	-	1099	-
Stage 2	-	-	-	-	540	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	643	-	-	-	~ 110	~ 261
Stage 1	-	-	-	-	319	-
Stage 2	-	-	-	-	584	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	643	-	-	-	~ 95	~ 261
Mov Cap-2 Maneuver	-	-	-	-	~ 95	-
Stage 1	-	-	-	-	~ 274	-
Stage 2	-	-	-	-	584	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.3	0		\$ 567.8		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	643	-	-	-	95	261
HCM Lane V/C Ratio	0.141	-	-	-	2.998	1.375
HCM Control Delay (s)	11.5	-	-	-	\$ 995.7	228.3
HCM Lane LOS	B	-	-	-	F	F
HCM 95th %tile Q(veh)	0.5	-	-	-	27.6	19.2
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	36.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	82	310	447	32	17	130
Future Vol, veh/h	82	310	447	32	17	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	73	81	78	50	74
Heavy Vehicles, %	0	0	1	3	6	2
Mvmt Flow	89	425	552	41	34	176
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	817	573	0	0	593	0
Stage 1	573	-	-	-	-	-
Stage 2	244	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.16	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.254	-
Pot Cap-1 Maneuver	349	523	-	-	964	-
Stage 1	568	-	-	-	-	-
Stage 2	801	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	335	523	-	-	964	-
Mov Cap-2 Maneuver	335	-	-	-	-	-
Stage 1	546	-	-	-	-	-
Stage 2	801	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	92.8	0	1.4			
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	477	964	-	
HCM Lane V/C Ratio	-	-	1.077	0.035	-	
HCM Control Delay (s)	-	-	92.8	8.9	0	
HCM Lane LOS	-	-	F	A	A	
HCM 95th %tile Q(veh)	-	-	16.4	0.1	-	

Intersection												
Int Delay, s/veh	3.4											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	126	0	0	0	0	0	0	0	0	405	0
Future Vol, veh/h	0	126	0	0	0	0	0	0	0	0	405	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	94	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	134	0	0	0	0	0	0	0	0	450	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	450	-	-	450	-	-	0	-	-	-	0
Stage 1	-	0	-	-	450	-	-	-	-	-	-	-
Stage 2	-	450	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	504	0	0	504	0	0	-	0	0	-	0
Stage 1	0	-	0	0	572	0	0	-	0	0	-	0
Stage 2	0	572	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	504	-	-	504	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	504	-	-	504	-	-	-	-	-	-	-
Stage 1	-	-	-	-	572	-	-	-	-	-	-	-
Stage 2	-	572	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	14.7		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	-		504		-		-					
HCM Lane V/C Ratio	-		0.266		-		-					
HCM Control Delay (s)	-		14.7		0		-					
HCM Lane LOS	-		B		A		-					
HCM 95th %tile Q(veh)	-		1.1		-		-					

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	14	0	0	0	0	0	0	0	0	405	0
Future Vol, veh/h	0	14	0	0	0	0	0	0	0	0	405	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	81	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	8	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	17	0	0	0	0	0	0	0	0	450	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	450	-	-	450	-	-	0	-	-	-	0
Stage 1	-	450	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	450	-	-	-	-	-	-	-
Critical Hdwy	-	6.58	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.072	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	496	0	0	504	0	0	-	0	0	-	0
Stage 1	0	562	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	572	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	496	-	-	504	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	496	-	-	504	-	-	-	-	-	-	-
Stage 1	-	562	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	572	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	12.4		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1 EBLn2WBLn1WBLn2		SBT									
Capacity (veh/h)	- 496 496		- -		-							
HCM Lane V/C Ratio	- 0.017 0.017		- -		-							
HCM Control Delay (s)	- 12.4 12.4		0 0		-							
HCM Lane LOS	- B B		A A		-							
HCM 95th %tile Q(veh)	- 0.1 0.1		- -		-							

Intersection						
Int Delay, s/veh	7.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	14	0	0	0	0	90
Future Vol, veh/h	14	0	0	0	0	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	92	92	92	92	94
Heavy Vehicles, %	8	2	2	2	2	2
Mvmt Flow	17	0	0	0	0	96
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	9
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	1070
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	1070
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		8.7	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	1070	-	-			
HCM Lane V/C Ratio	0.089	-	-			
HCM Control Delay (s)	8.7	-	-			
HCM Lane LOS	A	-	-			
HCM 95th %tile Q(veh)	0.3	-	-			

Appendix C-7

SYNCRO Level of Service Analysis: 2025 No Build

Intersection												
Int Delay, s/veh	11.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↗			↗	↗
Traffic Vol, veh/h	17	264	123	0	13	6	145	44	0	6	21	6
Future Vol, veh/h	17	264	123	0	13	6	145	44	0	6	21	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	58	85	83	25	65	100	87	84	39	33	53	42
Heavy Vehicles, %	0	1	1	0	1	1	0	4	0	0	2	2
Mvmt Flow	29	311	148	0	20	6	167	52	0	18	40	14
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	475	462	40	-	462	52	40	0	-	52	0	0
Stage 1	76	76	-	-	386	-	-	-	-	-	-	-
Stage 2	399	386	-	-	76	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.51	6.21	-	6.51	6.21	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.009	3.309	-	4.009	3.309	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	503	498	1034	0	498	1019	1583	-	0	1567	-	-
Stage 1	938	834	-	0	612	-	-	-	0	-	-	-
Stage 2	631	612	-	0	834	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	439	438	1034	-	438	1019	1583	-	-	1567	-	-
Mov Cap-2 Maneuver	439	438	-	-	438	-	-	-	-	-	-	-
Stage 1	836	824	-	-	545	-	-	-	-	-	-	-
Stage 2	538	545	-	-	824	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	15.6			12.4			5.7			1.8		
HCM LOS	C			B								
Minor Lane/Major Mvmt	NBL		NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR	
Capacity (veh/h)	1583		-	438	438	1034	438	557	1567	-	-	
HCM Lane V/C Ratio	0.105		-	0.421	0.355	0.143	0.023	0.029	0.012	-	-	
HCM Control Delay (s)	7.5		0	19.1	17.7	9.1	13.4	11.7	7.3	-	-	
HCM Lane LOS	A		A	C	C	A	B	B	A	-	-	
HCM 95th %tile Q(veh)	0.4		-	2.1	1.6	0.5	0.1	0.1	0	-	-	

Intersection						
Int Delay, s/veh	158.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	367	943	462	381	125	161
Future Vol, veh/h	367	943	462	381	125	161
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	86	92	95	84	83	81
Heavy Vehicles, %	1	1	5	3	3	2
Mvmt Flow	427	1025	486	454	151	199
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	486	0	-	0	2365	486
Stage 1	-	-	-	-	486	-
Stage 2	-	-	-	-	1879	-
Critical Hdwy	4.11	-	-	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.209	-	-	-	3.527	3.318
Pot Cap-1 Maneuver	1082	-	-	-	~ 38	581
Stage 1	-	-	-	-	616	-
Stage 2	-	-	-	-	~ 131	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1082	-	-	-	~ 23	581
Mov Cap-2 Maneuver	-	-	-	-	~ 23	-
Stage 1	-	-	-	-	373	-
Stage 2	-	-	-	-	~ 131	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.1	0		\$ 1228.5		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1082	-	-	-	23	581
HCM Lane V/C Ratio	0.394	-	-	-	6.548	0.342
HCM Control Delay (s)	10.5	-	-	-	\$ 2830.9	14.4
HCM Lane LOS	B	-	-	-	F	B
HCM 95th %tile Q(veh)	1.9	-	-	-	18.9	1.5
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	4.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	43	31	182	266	163	337
Future Vol, veh/h	43	31	182	266	163	337
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	50	89	86	94	91
Heavy Vehicles, %	10	7	1	1	0	2
Mvmt Flow	66	62	204	309	173	370
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1075	359	0	0	513	0
Stage 1	359	-	-	-	-	-
Stage 2	716	-	-	-	-	-
Critical Hdwy	6.5	6.27	-	-	4.1	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.363	-	-	2.2	-
Pot Cap-1 Maneuver	235	674	-	-	1063	-
Stage 1	689	-	-	-	-	-
Stage 2	470	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	187	674	-	-	1063	-
Mov Cap-2 Maneuver	187	-	-	-	-	-
Stage 1	548	-	-	-	-	-
Stage 2	470	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	27.1	0	2.9			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	288	1063	-	
HCM Lane V/C Ratio	-	-	0.445	0.163	-	
HCM Control Delay (s)	-	-	27.1	9	0	
HCM Lane LOS	-	-	D	A	A	
HCM 95th %tile Q(veh)	-	-	2.2	0.6	-	

Intersection												
Int Delay, s/veh	6.9											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	189	0	0	0	0	0	0	0	0	143	0
Future Vol, veh/h	0	189	0	0	0	0	0	0	0	0	143	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	86	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	7	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	220	0	0	0	0	0	0	0	0	166	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	166	-	-	166	-	-	0	-	-	-	0
Stage 1	-	0	-	-	166	-	-	-	-	-	-	-
Stage 2	-	166	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.57	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.063	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	718	0	0	727	0	0	-	0	0	-	0
Stage 1	0	-	0	0	761	0	0	-	0	0	-	0
Stage 2	0	752	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	718	-	-	727	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	718	-	-	727	-	-	-	-	-	-	-
Stage 1	-	-	-	-	761	-	-	-	-	-	-	-
Stage 2	-	752	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	12.2		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	- 718		-		-							
HCM Lane V/C Ratio	- 0.306		-		-							
HCM Control Delay (s)	- 12.2		0		-							
HCM Lane LOS	- B		A		-							
HCM 95th %tile Q(veh)	- 1.3		-		-							

Intersection												
Int Delay, s/veh	7.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	270	0	0	0	0	0	0	0	0	143	0
Future Vol, veh/h	0	270	0	0	0	0	0	0	0	0	143	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	85	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	0	2	2	2	2	2	2	2	2	7	2
Mvmt Flow	0	318	0	0	0	0	0	0	0	0	166	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	166	-	-	166	-	-	0	-	-	-	0
Stage 1	-	166	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	166	-	-	-	-	-	-	-
Critical Hdwy	-	6.5	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	730	0	0	727	0	0	-	0	0	-	0
Stage 1	0	765	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	761	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	730	-	-	727	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	730	-	-	727	-	-	-	-	-	-	-
Stage 1	-	765	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	761	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	11.3		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1		EBLn2WBLn1		WBLn2 SBT							
Capacity (veh/h)	- 730		730		- -		-					
HCM Lane V/C Ratio	- 0.218		0.218		- -		-					
HCM Control Delay (s)	- 11.3		11.3		0 0		-					
HCM Lane LOS	- B		B		A A		-					
HCM 95th %tile Q(veh)	- 0.8		0.8		- -		-					

Intersection						
Int Delay, s/veh	14.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	270	0	0	0	0	565
Future Vol, veh/h	270	0	0	0	0	565
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	92	92	92	92	85
Heavy Vehicles, %	0	2	2	2	2	2
Mvmt Flow	318	0	0	0	0	665
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	159
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	858
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	858
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		22	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	858	-	-			
HCM Lane V/C Ratio	0.775	-	-			
HCM Control Delay (s)	22	-	-			
HCM Lane LOS	C	-	-			
HCM 95th %tile Q(veh)	7.8	-	-			

Intersection												
Int Delay, s/veh	9.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↗			↗	↗
Traffic Vol, veh/h	6	17	159	0	269	1	110	21	0	1	44	22
Future Vol, veh/h	6	17	159	0	269	1	110	21	0	1	44	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	81	78	97	90	25	90	57	39	25	62	50
Heavy Vehicles, %	0	8	0	0	1	0	0	13	0	0	6	0
Mvmt Flow	10	21	204	0	299	4	122	37	0	4	71	44
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	512	360	71	-	360	37	71	0	-	37	0	0
Stage 1	79	79	-	-	281	-	-	-	-	-	-	-
Stage 2	433	281	-	-	79	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.58	6.2	-	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.072	3.3	-	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	476	557	997	0	568	1041	1542	-	0	1587	-	-
Stage 1	935	818	-	0	680	-	-	-	0	-	-	-
Stage 2	605	668	-	0	831	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	243	510	997	-	520	1041	1542	-	-	1587	-	-
Mov Cap-2 Maneuver	243	510	-	-	520	-	-	-	-	-	-	-
Stage 1	859	816	-	-	625	-	-	-	-	-	-	-
Stage 2	289	614	-	-	829	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10.2		14.6		5.8		0.2					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL		NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR	
Capacity (veh/h)	1542		-	335	510	997	520	527	1587	-	-	
HCM Lane V/C Ratio	0.079		-	0.06	0.021	0.204	0.287	0.291	0.003	-	-	
HCM Control Delay (s)	7.5		0	16.4	12.2	9.5	14.7	14.6	7.3	-	-	
HCM Lane LOS	A		A	C	B	A	B	B	A	-	-	
HCM 95th %tile Q(veh)	0.3		-	0.2	0.1	0.8	1.2	1.2	0	-	-	

Intersection						
Int Delay, s/veh	267.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	74	315	1100	194	269	386
Future Vol, veh/h	74	315	1100	194	269	386
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	83	95	79	79	90
Heavy Vehicles, %	0	3	1	1	2	0
Mvmt Flow	101	380	1158	246	341	429
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	1158	0	-	0	1740	1158
Stage 1	-	-	-	-	1158	-
Stage 2	-	-	-	-	582	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	611	-	-	-	~ 96	~ 241
Stage 1	-	-	-	-	~ 299	-
Stage 2	-	-	-	-	559	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	611	-	-	-	~ 80	~ 241
Mov Cap-2 Maneuver	-	-	-	-	~ 80	-
Stage 1	-	-	-	-	~ 250	-
Stage 2	-	-	-	-	559	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.5	0		\$ 919.9		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	611	-	-	-	80	241
HCM Lane V/C Ratio	0.166	-	-	-	4.256	1.78
HCM Control Delay (s)	12.1	-	-	-	\$ 1572	\$ 402.1
HCM Lane LOS	B	-	-	-	F	F
HCM 95th %tile Q(veh)	0.6	-	-	-	36.1	29
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	74.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	95	359	471	35	19	137
Future Vol, veh/h	95	359	471	35	19	137
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	73	81	78	50	74
Heavy Vehicles, %	0	0	1	3	6	2
Mvmt Flow	103	492	581	45	38	185
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	865	604	0	0	626	0
Stage 1	604	-	-	-	-	-
Stage 2	261	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.16	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.254	-
Pot Cap-1 Maneuver	327	502	-	-	937	-
Stage 1	550	-	-	-	-	-
Stage 2	787	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	312	502	-	-	937	-
Mov Cap-2 Maneuver	312	-	-	-	-	-
Stage 1	525	-	-	-	-	-
Stage 2	787	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	180.6	0		1.5		
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-	454	937	-	
HCM Lane V/C Ratio	-	-	1.311	0.041	-	
HCM Control Delay (s)	-	-	180.6	9	0	
HCM Lane LOS	-	-	F	A	A	
HCM 95th %tile Q(veh)	-	-	26.2	0.1	-	

Intersection												
Int Delay, s/veh	3.4											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	131	0	0	0	0	0	0	0	0	507	0
Future Vol, veh/h	0	131	0	0	0	0	0	0	0	0	507	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	94	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	139	0	0	0	0	0	0	0	0	563	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	563	-	-	563	-	-	0	-	-	-	0
Stage 1	-	0	-	-	563	-	-	-	-	-	-	-
Stage 2	-	563	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	435	0	0	435	0	0	-	0	0	-	0
Stage 1	0	-	0	0	509	0	0	-	0	0	-	0
Stage 2	0	509	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	435	-	-	435	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	435	-	-	435	-	-	-	-	-	-	-
Stage 1	-	-	-	-	509	-	-	-	-	-	-	-
Stage 2	-	509	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	17.1		0		0		0					
HCM LOS	C		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	-		435		-		-					
HCM Lane V/C Ratio	-		0.32		-		-					
HCM Control Delay (s)	-		17.1		0		-					
HCM Lane LOS	-		C		A		-					
HCM 95th %tile Q(veh)	-		1.4		-		-					

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	18	0	0	0	0	0	0	0	0	507	0
Future Vol, veh/h	0	18	0	0	0	0	0	0	0	0	507	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	81	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	8	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	22	0	0	0	0	0	0	0	0	563	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	563	-	-	563	-	-	0	-	-	-	0
Stage 1	-	563	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	563	-	-	-	-	-	-	-
Critical Hdwy	-	6.58	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.072	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	427	0	0	435	0	0	-	0	0	-	0
Stage 1	0	499	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	509	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	427	-	-	435	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	427	-	-	435	-	-	-	-	-	-	-
Stage 1	-	499	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	509	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	13.7		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1 EBLn2WBLn1WBLn2		SBT									
Capacity (veh/h)	- 427 427		- - -									
HCM Lane V/C Ratio	- 0.026 0.026		- - -									
HCM Control Delay (s)	- 13.7 13.7		0 0									
HCM Lane LOS	- B B		A A									
HCM 95th %tile Q(veh)	- 0.1 0.1		- - -									

Intersection						
Int Delay, s/veh	7.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	18	0	0	0	0	113
Future Vol, veh/h	18	0	0	0	0	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	92	92	92	92	94
Heavy Vehicles, %	8	2	2	2	2	2
Mvmt Flow	22	0	0	0	0	120
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	11
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	1067
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	1067
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		8.8	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	1067	-	-			
HCM Lane V/C Ratio	0.113	-	-			
HCM Control Delay (s)	8.8	-	-			
HCM Lane LOS	A	-	-			
HCM 95th %tile Q(veh)	0.4	-	-			

Appendix C-8

SYNCRO Level of Service Analysis: 2025 Build

Intersection												
Int Delay, s/veh	11.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↗			↗	↗
Traffic Vol, veh/h	18	264	125	0	17	6	149	45	0	7	26	7
Future Vol, veh/h	18	264	125	0	17	6	149	45	0	7	26	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	58	85	83	25	65	100	87	84	39	33	53	42
Heavy Vehicles, %	0	1	1	0	1	1	0	4	0	0	2	2
Mvmt Flow	31	311	151	0	26	6	171	54	0	21	49	17
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	503	487	49	-	487	54	49	0	-	54	0	0
Stage 1	91	91	-	-	396	-	-	-	-	-	-	-
Stage 2	412	396	-	-	91	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.51	6.21	-	6.51	6.21	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.009	3.309	-	4.009	3.309	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	482	482	1022	0	482	1016	1571	-	0	1564	-	-
Stage 1	921	821	-	0	606	-	-	-	0	-	-	-
Stage 2	621	606	-	0	821	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	414	422	1022	-	422	1016	1571	-	-	1564	-	-
Mov Cap-2 Maneuver	414	422	-	-	422	-	-	-	-	-	-	-
Stage 1	818	810	-	-	538	-	-	-	-	-	-	-
Stage 2	522	538	-	-	810	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	16.2			12.9			5.8			1.8		
HCM LOS	C			B								
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1571	-	421	422	1022	422	517	1564	-	-		
HCM Lane V/C Ratio	0.109	-	0.443	0.368	0.147	0.031	0.037	0.014	-	-		
HCM Control Delay (s)	7.6	0	20.2	18.4	9.1	13.8	12.2	7.3	-	-		
HCM Lane LOS	A	A	C	C	A	B	B	A	-	-		
HCM 95th %tile Q(veh)	0.4	-	2.2	1.7	0.5	0.1	0.1	0	-	-		

Intersection						
Int Delay, s/veh	165.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	369	943	462	384	128	165
Future Vol, veh/h	369	943	462	384	128	165
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	86	92	95	84	83	81
Heavy Vehicles, %	1	1	5	3	3	2
Mvmt Flow	429	1025	486	457	154	204
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	486	0	-	0	2369	486
Stage 1	-	-	-	-	486	-
Stage 2	-	-	-	-	1883	-
Critical Hdwy	4.11	-	-	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.209	-	-	-	3.527	3.318
Pot Cap-1 Maneuver	1082	-	-	-	~ 38	581
Stage 1	-	-	-	-	616	-
Stage 2	-	-	-	-	~ 131	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1082	-	-	-	~ 23	581
Mov Cap-2 Maneuver	-	-	-	-	~ 23	-
Stage 1	-	-	-	-	372	-
Stage 2	-	-	-	-	~ 131	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.1	0		\$ 1258.3		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1082	-	-	-	23	581
HCM Lane V/C Ratio	0.397	-	-	-	6.705	0.351
HCM Control Delay (s)	10.5	-	-	-	\$ 2901.2	14.5
HCM Lane LOS	B	-	-	-	F	B
HCM 95th %tile Q(veh)	1.9	-	-	-	19.4	1.6
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection

Int Delay, s/veh 4.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
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Lane Configurations

Traffic Vol, veh/h	44	31	182	268	164	337
Future Vol, veh/h	44	31	182	268	164	337
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	50	89	86	94	91
Heavy Vehicles, %	10	7	1	1	0	2
Mvmt Flow	68	62	204	312	174	370

Major/Minor	Minor1	Major1	Major2
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Conflicting Flow All	1078	360	0	0	516	0
Stage 1	360	-	-	-	-	-
Stage 2	718	-	-	-	-	-
Critical Hdwy	6.5	6.27	-	-	4.1	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.363	-	-	2.2	-
Pot Cap-1 Maneuver	234	673	-	-	1060	-
Stage 1	689	-	-	-	-	-
Stage 2	469	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	186	673	-	-	1060	-
Mov Cap-2 Maneuver	186	-	-	-	-	-
Stage 1	546	-	-	-	-	-
Stage 2	469	-	-	-	-	-

Approach	WB	NB	SB
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HCM Control Delay, s	27.9	0	2.9
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
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Capacity (veh/h)	-	-	284	1060	-
HCM Lane V/C Ratio	-	-	0.457	0.165	-
HCM Control Delay (s)	-	-	27.9	9.1	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0.6	-

Intersection												
Int Delay, s/veh	7.1											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	194	0	0	0	0	0	0	0	0	143	0
Future Vol, veh/h	0	194	0	0	0	0	0	0	0	0	143	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	86	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	7	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	226	0	0	0	0	0	0	0	0	166	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	166	-	-	166	-	-	0	-	-	-	0
Stage 1	-	0	-	-	166	-	-	-	-	-	-	-
Stage 2	-	166	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.57	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.063	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	718	0	0	727	0	0	-	0	0	-	0
Stage 1	0	-	0	0	761	0	0	-	0	0	-	0
Stage 2	0	752	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	718	-	-	727	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	718	-	-	727	-	-	-	-	-	-	-
Stage 1	-	-	-	-	761	-	-	-	-	-	-	-
Stage 2	-	752	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	12.3		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	- 718		-		-							
HCM Lane V/C Ratio	- 0.314		-		-							
HCM Control Delay (s)	- 12.3		0		-							
HCM Lane LOS	- B		A		-							
HCM 95th %tile Q(veh)	- 1.3		-		-							

Intersection												
Int Delay, s/veh	7.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	271	0	0	0	0	0	0	0	0	143	0
Future Vol, veh/h	0	271	0	0	0	0	0	0	0	0	143	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	85	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	0	2	2	2	2	2	2	2	2	7	2
Mvmt Flow	0	319	0	0	0	0	0	0	0	0	166	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	166	-	-	166	-	-	0	-	-	-	0
Stage 1	-	166	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	166	-	-	-	-	-	-	-
Critical Hdwy	-	6.5	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	730	0	0	727	0	0	-	0	0	-	0
Stage 1	0	765	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	761	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	730	-	-	727	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	730	-	-	727	-	-	-	-	-	-	-
Stage 1	-	765	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	761	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	11.3		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1 EBLn2WBLn1WBLn2		SBT									
Capacity (veh/h)	- 730 730		- - -									
HCM Lane V/C Ratio	- 0.218 0.218		- - -									
HCM Control Delay (s)	- 11.3 11.3		0 0									
HCM Lane LOS	- B B		A A									
HCM 95th %tile Q(veh)	- 0.8 0.8		- - -									

Intersection						
Int Delay, s/veh	14.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	271	0	0	0	0	565
Future Vol, veh/h	271	0	0	0	0	565
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	92	92	92	92	85
Heavy Vehicles, %	0	2	2	2	2	2
Mvmt Flow	319	0	0	0	0	665
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	-	-	-	-	160
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	857
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	857
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0	22.1			
HCM LOS			C			
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	857	-	-			
HCM Lane V/C Ratio	0.776	-	-			
HCM Control Delay (s)	22.1	-	-			
HCM Lane LOS	C	-	-			
HCM 95th %tile Q(veh)	7.8	-	-			

Intersection												
Int Delay, s/veh	9.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↗			↗	↗
Traffic Vol, veh/h	6	17	163	0	269	1	112	21	0	1	42	21
Future Vol, veh/h	6	17	163	0	269	1	112	21	0	1	42	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	81	78	97	90	25	90	57	39	25	62	50
Heavy Vehicles, %	0	8	0	0	1	0	0	13	0	0	6	0
Mvmt Flow	10	21	209	0	299	4	124	37	0	4	68	42
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	513	361	68	-	361	37	68	0	-	37	0	0
Stage 1	76	76	-	-	285	-	-	-	-	-	-	-
Stage 2	437	285	-	-	76	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.58	6.2	-	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.072	3.3	-	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	475	557	1001	0	568	1041	1546	-	0	1587	-	-
Stage 1	938	820	-	0	678	-	-	-	0	-	-	-
Stage 2	602	665	-	0	834	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	242	510	1001	-	520	1041	1546	-	-	1587	-	-
Mov Cap-2 Maneuver	242	510	-	-	520	-	-	-	-	-	-	-
Stage 1	861	818	-	-	622	-	-	-	-	-	-	-
Stage 2	286	610	-	-	831	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10.2		14.6		5.8		0.3					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1546	-	334	510	1001	520	527	1587	-	-		
HCM Lane V/C Ratio	0.08	-	0.06	0.021	0.209	0.287	0.291	0.003	-	-		
HCM Control Delay (s)	7.5	0	16.5	12.2	9.5	14.7	14.6	7.3	-	-		
HCM Lane LOS	A	A	C	B	A	B	B	A	-	-		
HCM 95th %tile Q(veh)	0.3	-	0.2	0.1	0.8	1.2	1.2	0	-	-		

Intersection						
Int Delay, s/veh	268.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	74	315	1100	196	270	387
Future Vol, veh/h	74	315	1100	196	270	387
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	83	95	79	79	90
Heavy Vehicles, %	0	3	1	1	2	0
Mvmt Flow	101	380	1158	248	342	430
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	1158	0	-	0	1740	1158
Stage 1	-	-	-	-	1158	-
Stage 2	-	-	-	-	582	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	611	-	-	-	~ 96	~ 241
Stage 1	-	-	-	-	~ 299	-
Stage 2	-	-	-	-	559	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	611	-	-	-	~ 80	~ 241
Mov Cap-2 Maneuver	-	-	-	-	~ 80	-
Stage 1	-	-	-	-	~ 250	-
Stage 2	-	-	-	-	559	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.5	0		\$ 924.4		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	611	-	-	-	80	241
HCM Lane V/C Ratio	0.166	-	-	-	4.272	1.784
HCM Control Delay (s)	12.1	-	-	-	\$ 1579	\$ 404.1
HCM Lane LOS	B	-	-	-	F	F
HCM 95th %tile Q(veh)	0.6	-	-	-	36.3	29.2
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	75.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	96	359	471	35	20	137
Future Vol, veh/h	96	359	471	35	20	137
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	73	81	78	50	74
Heavy Vehicles, %	0	0	1	3	6	2
Mvmt Flow	104	492	581	45	40	185
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	869	604	0	0	626	0
Stage 1	604	-	-	-	-	-
Stage 2	265	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.16	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.254	-
Pot Cap-1 Maneuver	325	502	-	-	937	-
Stage 1	550	-	-	-	-	-
Stage 2	784	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	309	502	-	-	937	-
Mov Cap-2 Maneuver	309	-	-	-	-	-
Stage 1	524	-	-	-	-	-
Stage 2	784	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	182.8	0		1.6		
HCM LOS	F					
Minor Lane/Major Mvmt		NBT	NBRWBLn1	SBL	SBT	
Capacity (veh/h)		-	-	453	937	-
HCM Lane V/C Ratio		-	-	1.316	0.043	-
HCM Control Delay (s)		-	-	182.8	9	0
HCM Lane LOS		-	-	F	A	A
HCM 95th %tile Q(veh)		-	-	26.4	0.1	-

Intersection												
Int Delay, s/veh	3.5											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	133	0	0	0	0	0	0	0	0	507	0
Future Vol, veh/h	0	133	0	0	0	0	0	0	0	0	507	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	94	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	141	0	0	0	0	0	0	0	0	563	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	563	-	-	563	-	-	0	-	-	-	0
Stage 1	-	0	-	-	563	-	-	-	-	-	-	-
Stage 2	-	563	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	435	0	0	435	0	0	-	0	0	-	0
Stage 1	0	-	0	0	509	0	0	-	0	0	-	0
Stage 2	0	509	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	435	-	-	435	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	435	-	-	435	-	-	-	-	-	-	-
Stage 1	-	-	-	-	509	-	-	-	-	-	-	-
Stage 2	-	509	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	17.2		0		0		0					
HCM LOS	C		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	-		435		-		-					
HCM Lane V/C Ratio	-		0.325		-		-					
HCM Control Delay (s)	-		17.2		0		-					
HCM Lane LOS	-		C		A		-					
HCM 95th %tile Q(veh)	-		1.4		-		-					

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	18	0	0	0	0	0	0	0	0	507	0
Future Vol, veh/h	0	18	0	0	0	0	0	0	0	0	507	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	81	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	8	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	22	0	0	0	0	0	0	0	0	563	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	563	-	-	563	-	-	0	-	-	-	0
Stage 1	-	563	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	563	-	-	-	-	-	-	-
Critical Hdwy	-	6.58	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.072	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	427	0	0	435	0	0	-	0	0	-	0
Stage 1	0	499	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	509	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	427	-	-	435	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	427	-	-	435	-	-	-	-	-	-	-
Stage 1	-	499	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	509	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	13.7		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1		EBLn2WBLn1		WBLn2		SBT					
Capacity (veh/h)	-		427		427		-		-		-	
HCM Lane V/C Ratio	-		0.026		0.026		-		-		-	
HCM Control Delay (s)	-		13.7		13.7		0		0		-	
HCM Lane LOS	-		B		B		A		A		-	
HCM 95th %tile Q(veh)	-		0.1		0.1		-		-		-	

Intersection						
Int Delay, s/veh	7.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	18	0	0	0	0	113
Future Vol, veh/h	18	0	0	0	0	113
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	92	92	92	92	94
Heavy Vehicles, %	8	2	2	2	2	2
Mvmt Flow	22	0	0	0	0	120
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	11
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	1067
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	1067
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		8.8	
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1		EBT	WBT		
Capacity (veh/h)	1067		-	-		
HCM Lane V/C Ratio	0.113		-	-		
HCM Control Delay (s)	8.8		-	-		
HCM Lane LOS	A		-	-		
HCM 95th %tile Q(veh)	0.4		-	-		

Appendix C-9

SYNCRO Level of Service Analysis: 2035 No Build

Intersection												
Int Delay, s/veh	12.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↑	↗		↔↑			↗			↔↑	↗
Traffic Vol, veh/h	17	279	131	0	18	6	154	44	0	6	21	6
Future Vol, veh/h	17	279	131	0	18	6	154	44	0	6	21	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	58	85	83	25	65	100	87	84	39	33	53	42
Heavy Vehicles, %	0	1	1	0	1	1	0	4	0	0	2	2
Mvmt Flow	29	328	158	0	28	6	177	52	0	18	40	14
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	499	482	40	-	482	52	40	0	-	52	0	0
Stage 1	76	76	-	-	406	-	-	-	-	-	-	-
Stage 2	423	406	-	-	76	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.51	6.21	-	6.51	6.21	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.009	3.309	-	4.009	3.309	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	485	485	1034	0	485	1019	1583	-	0	1567	-	-
Stage 1	938	834	-	0	600	-	-	-	0	-	-	-
Stage 2	613	600	-	0	834	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	414	424	1034	-	424	1019	1583	-	-	1567	-	-
Mov Cap-2 Maneuver	414	424	-	-	424	-	-	-	-	-	-	-
Stage 1	830	824	-	-	531	-	-	-	-	-	-	-
Stage 2	511	531	-	-	824	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	16.5			12.9			5.8			1.8		
HCM LOS	C			B								
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1583	-	422	424	1034	424	515	1567	-	-		
HCM Lane V/C Ratio	0.112	-	0.458	0.387	0.153	0.033	0.039	0.012	-	-		
HCM Control Delay (s)	7.6	0	20.5	18.8	9.1	13.8	12.3	7.3	-	-		
HCM Lane LOS	A	A	C	C	A	B	B	A	-	-		
HCM 95th %tile Q(veh)	0.4	-	2.3	1.8	0.5	0.1	0.1	0	-	-		

Intersection						
Int Delay, s/veh	218.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	387	1006	493	402	132	170
Future Vol, veh/h	387	1006	493	402	132	170
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	86	92	95	84	83	81
Heavy Vehicles, %	1	1	5	3	3	2
Mvmt Flow	450	1093	519	479	159	210
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	519	0	-	0	2512	519
Stage 1	-	-	-	-	519	-
Stage 2	-	-	-	-	1993	-
Critical Hdwy	4.11	-	-	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.209	-	-	-	3.527	3.318
Pot Cap-1 Maneuver	1052	-	-	-	~ 31	557
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	~ 115	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1052	-	-	-	~ 18	557
Mov Cap-2 Maneuver	-	-	-	-	~ 18	-
Stage 1	-	-	-	-	340	-
Stage 2	-	-	-	-	~ 115	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.2	0		\$ 1708.8		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1052	-	-	-	18	557
HCM Lane V/C Ratio	0.428	-	-	-	8.835	0.377
HCM Control Delay (s)	11	-	-	-	\$ 3943.6	15.3
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	2.2	-	-	-	20.5	1.7
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	33	194	281	172	360
Future Vol, veh/h	46	33	194	281	172	360
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	50	89	86	94	91
Heavy Vehicles, %	10	7	1	1	0	2
Mvmt Flow	71	66	218	327	183	396
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1144	382	0	0	545	0
Stage 1	382	-	-	-	-	-
Stage 2	762	-	-	-	-	-
Critical Hdwy	6.5	6.27	-	-	4.1	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.363	-	-	2.2	-
Pot Cap-1 Maneuver	213	654	-	-	1034	-
Stage 1	673	-	-	-	-	-
Stage 2	447	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	165	654	-	-	1034	-
Mov Cap-2 Maneuver	165	-	-	-	-	-
Stage 1	520	-	-	-	-	-
Stage 2	447	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	33.7	0	2.9			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	258	1034	-	
HCM Lane V/C Ratio	-	-	0.53	0.177	-	
HCM Control Delay (s)	-	-	33.7	9.2	0	
HCM Lane LOS	-	-	D	A	A	
HCM 95th %tile Q(veh)	-	-	2.8	0.6	-	

Intersection												
Int Delay, s/veh	7.1											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	198	0	0	0	0	0	0	0	0	151	0
Future Vol, veh/h	0	198	0	0	0	0	0	0	0	0	151	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	86	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	7	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	230	0	0	0	0	0	0	0	0	176	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	176	-	-	176	-	-	0	-	-	-	0
Stage 1	-	0	-	-	176	-	-	-	-	-	-	-
Stage 2	-	176	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.57	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.063	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	709	0	0	717	0	0	-	0	0	-	0
Stage 1	0	-	0	0	753	0	0	-	0	0	-	0
Stage 2	0	744	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	709	-	-	717	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	709	-	-	717	-	-	-	-	-	-	-
Stage 1	-	-	-	-	753	-	-	-	-	-	-	-
Stage 2	-	744	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	12.5		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	- 709		-		-							
HCM Lane V/C Ratio	- 0.325		-		-							
HCM Control Delay (s)	- 12.5		0		-							
HCM Lane LOS	- B		A		-							
HCM 95th %tile Q(veh)	- 1.4		-		-							

Intersection												
Int Delay, s/veh	7.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	285	0	0	0	0	0	0	0	0	151	0
Future Vol, veh/h	0	285	0	0	0	0	0	0	0	0	151	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	85	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	0	2	2	2	2	2	2	2	2	7	2
Mvmt Flow	0	335	0	0	0	0	0	0	0	0	176	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	176	-	-	176	-	-	0	-	-	-	0
Stage 1	-	176	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	176	-	-	-	-	-	-	-
Critical Hdwy	-	6.5	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	721	0	0	717	0	0	-	0	0	-	0
Stage 1	0	757	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	753	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	721	-	-	717	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	721	-	-	717	-	-	-	-	-	-	-
Stage 1	-	757	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	753	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	11.5		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1		EBLn2WBLn1		WBLn2		SBT					
Capacity (veh/h)	-		721		721		-		-		-	
HCM Lane V/C Ratio	-		0.233		0.233		-		-		-	
HCM Control Delay (s)	-		11.5		11.5		0		0		-	
HCM Lane LOS	-		B		B		A		A		-	
HCM 95th %tile Q(veh)	-		0.9		0.9		-		-		-	

Intersection						
Int Delay, s/veh	17.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	285	0	0	0	0	597
Future Vol, veh/h	285	0	0	0	0	597
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	92	92	92	92	85
Heavy Vehicles, %	0	2	2	2	2	2
Mvmt Flow	335	0	0	0	0	702
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	168
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	847
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	847
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		26.2	
HCM LOS					D	
Minor Lane/Major Mvmt	NBLn1	EBT	WBT			
Capacity (veh/h)	847	-	-			
HCM Lane V/C Ratio	0.829	-	-			
HCM Control Delay (s)	26.2	-	-			
HCM Lane LOS	D	-	-			
HCM 95th %tile Q(veh)	9.5	-	-			

Intersection												
Int Delay, s/veh	9.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↗			↗	↗
Traffic Vol, veh/h	6	18	169	0	284	1	118	21	0	1	44	22
Future Vol, veh/h	6	18	169	0	284	1	118	21	0	1	44	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	81	78	97	90	25	90	57	39	25	62	50
Heavy Vehicles, %	0	8	0	0	1	0	0	13	0	0	6	0
Mvmt Flow	10	22	217	0	316	4	131	37	0	4	71	44
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	538	378	71	-	378	37	71	0	-	37	0	0
Stage 1	79	79	-	-	299	-	-	-	-	-	-	-
Stage 2	459	299	-	-	79	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.58	6.2	-	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.072	3.3	-	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	457	544	997	0	555	1041	1542	-	0	1587	-	-
Stage 1	935	818	-	0	668	-	-	-	0	-	-	-
Stage 2	586	656	-	0	831	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	214	495	997	-	505	1041	1542	-	-	1587	-	-
Mov Cap-2 Maneuver	214	495	-	-	505	-	-	-	-	-	-	-
Stage 1	854	816	-	-	610	-	-	-	-	-	-	-
Stage 2	257	599	-	-	829	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10.4		15.2		5.9		0.2					
HCM LOS	B		C									
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1542	-	308	495	997	505	512	1587	-	-		
HCM Lane V/C Ratio	0.085	-	0.067	0.022	0.217	0.312	0.316	0.003	-	-		
HCM Control Delay (s)	7.6	0	17.5	12.4	9.6	15.3	15.2	7.3	-	-		
HCM Lane LOS	A	A	C	B	A	C	C	A	-	-		
HCM 95th %tile Q(veh)	0.3	-	0.2	0.1	0.8	1.3	1.3	0	-	-		

Intersection						
Int Delay, s/veh	356.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	78	336	1174	205	283	407
Future Vol, veh/h	78	336	1174	205	283	407
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	83	95	79	79	90
Heavy Vehicles, %	0	3	1	1	2	0
Mvmt Flow	107	405	1236	259	358	452
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	1236	0	-	0	1855	1236
Stage 1	-	-	-	-	1236	-
Stage 2	-	-	-	-	619	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	571	-	-	-	~ 81	~ 217
Stage 1	-	-	-	-	~ 274	-
Stage 2	-	-	-	-	537	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	571	-	-	-	~ 66	~ 217
Mov Cap-2 Maneuver	-	-	-	-	~ 66	-
Stage 1	-	-	-	-	~ 223	-
Stage 2	-	-	-	-	537	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.7	0		\$ 1236.6		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	571	-	-	-	66	217
HCM Lane V/C Ratio	0.187	-	-	-	5.428	2.084
HCM Control Delay (s)	12.8	-	-	-	\$ 2116.8	\$ 539.4
HCM Lane LOS	B	-	-	-	F	F
HCM 95th %tile Q(veh)	0.7	-	-	-	39.9	34.3
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	102.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	101	379	503	37	20	146
Future Vol, veh/h	101	379	503	37	20	146
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	73	81	78	50	74
Heavy Vehicles, %	0	0	1	3	6	2
Mvmt Flow	110	519	621	47	40	197
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	922	645	0	0	668	0
Stage 1	645	-	-	-	-	-
Stage 2	277	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.16	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.254	-
Pot Cap-1 Maneuver	302	~ 476	-	-	903	-
Stage 1	526	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	287	~ 476	-	-	903	-
Mov Cap-2 Maneuver	287	-	-	-	-	-
Stage 1	500	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	249.9	0		1.5		
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-	427	903	-	
HCM Lane V/C Ratio	-	-	1.473	0.044	-	
HCM Control Delay (s)	-	-	249.9	9.2	0	
HCM Lane LOS	-	-	F	A	A	
HCM 95th %tile Q(veh)	-	-	32.5	0.1	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection												
Int Delay, s/veh	3.6											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	139	0	0	0	0	0	0	0	0	535	0
Future Vol, veh/h	0	139	0	0	0	0	0	0	0	0	535	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	94	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	148	0	0	0	0	0	0	0	0	594	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	594	-	-	594	-	-	0	-	-	-	0
Stage 1	-	0	-	-	594	-	-	-	-	-	-	-
Stage 2	-	594	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	418	0	0	418	0	0	-	0	0	-	0
Stage 1	0	-	0	0	493	0	0	-	0	0	-	0
Stage 2	0	493	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	418	-	-	418	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	418	-	-	418	-	-	-	-	-	-	-
Stage 1	-	-	-	-	493	-	-	-	-	-	-	-
Stage 2	-	493	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	18.3		0		0		0					
HCM LOS	C		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	- 418		-		-							
HCM Lane V/C Ratio	- 0.354		-		-							
HCM Control Delay (s)	- 18.3		0		-							
HCM Lane LOS	- C		A		-							
HCM 95th %tile Q(veh)	- 1.6		-		-							

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	16	0	0	0	0	0	0	0	0	535	0
Future Vol, veh/h	0	16	0	0	0	0	0	0	0	0	535	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	81	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	8	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	20	0	0	0	0	0	0	0	0	594	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	594	-	-	594	-	-	0	-	-	-	0
Stage 1	-	594	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	594	-	-	-	-	-	-	-
Critical Hdwy	-	6.58	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.072	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	410	0	0	418	0	0	-	0	0	-	0
Stage 1	0	484	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	493	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	410	-	-	418	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	410	-	-	418	-	-	-	-	-	-	-
Stage 1	-	484	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	493	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	14		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT		EBLn1	EBLn2	WBLn1	WBLn2	SBT					
Capacity (veh/h)			-	410	410	-	-	-				
HCM Lane V/C Ratio			-	0.024	0.024	-	-	-				
HCM Control Delay (s)			-	14	14	0	0	-				
HCM Lane LOS			-	B	B	A	A	-				
HCM 95th %tile Q(veh)			-	0.1	0.1	-	-	-				

Intersection

Int Delay, s/veh 7.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
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Lane Configurations

Traffic Vol, veh/h	16	0	0	0	0	119
Future Vol, veh/h	16	0	0	0	0	119
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	92	92	92	92	94
Heavy Vehicles, %	8	2	2	2	2	2
Mvmt Flow	20	0	0	0	0	127

Major/Minor	Major1	Major2	Minor1
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Conflicting Flow All	0	-	-	-	-	10
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	1069
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	1069
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
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HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
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Capacity (veh/h)	1069	-	-
HCM Lane V/C Ratio	0.118	-	-
HCM Control Delay (s)	8.8	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-

Appendix C-10

SYNCRO Level of Service Analysis: 2035 Build

Intersection												
Int Delay, s/veh	12.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↔			↗	↗
Traffic Vol, veh/h	20	279	135	0	18	7	161	52	0	9	32	9
Future Vol, veh/h	20	279	135	0	18	7	161	52	0	9	32	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	58	85	83	25	65	100	87	84	39	33	53	42
Heavy Vehicles, %	0	1	1	0	1	1	0	4	0	0	2	2
Mvmt Flow	34	328	163	0	28	7	185	62	0	27	60	21
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	564	546	60	-	546	62	60	0	-	62	0	0
Stage 1	114	114	-	-	432	-	-	-	-	-	-	-
Stage 2	450	432	-	-	114	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.51	6.21	-	6.51	6.21	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.51	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.009	3.309	-	4.009	3.309	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	439	447	1008	0	447	1006	1556	-	0	1554	-	-
Stage 1	896	803	-	0	584	-	-	-	0	-	-	-
Stage 2	592	584	-	0	803	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	369	385	1008	-	385	1006	1556	-	-	1554	-	-
Mov Cap-2 Maneuver	369	385	-	-	385	-	-	-	-	-	-	-
Stage 1	786	789	-	-	512	-	-	-	-	-	-	-
Stage 2	488	512	-	-	789	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	18.6			13.5			5.7			1.8		
HCM LOS	C			B								
Minor Lane/Major Mvmt	NBL		NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR	
Capacity (veh/h)	1556		-	382	385	1008	385	486	1554	-	-	
HCM Lane V/C Ratio	0.119		-	0.52	0.426	0.161	0.036	0.043	0.018	-	-	
HCM Control Delay (s)	7.6		0	24.2	21.1	9.3	14.7	12.7	7.4	-	-	
HCM Lane LOS	A		A	C	C	A	B	B	A	-	-	
HCM 95th %tile Q(veh)	0.4		-	2.9	2.1	0.6	0.1	0.1	0.1	-	-	

Intersection						
Int Delay, s/veh	250.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	394	1006	493	410	138	179
Future Vol, veh/h	394	1006	493	410	138	179
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	86	92	95	84	83	81
Heavy Vehicles, %	1	1	5	3	3	2
Mvmt Flow	458	1093	519	488	166	221
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	519	0	-	0	2528	519
Stage 1	-	-	-	-	519	-
Stage 2	-	-	-	-	2009	-
Critical Hdwy	4.11	-	-	-	6.43	6.22
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.209	-	-	-	3.527	3.318
Pot Cap-1 Maneuver	1052	-	-	-	~ 30	557
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	~ 113	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1052	-	-	-	~ 17	557
Mov Cap-2 Maneuver	-	-	-	-	~ 17	-
Stage 1	-	-	-	-	336	-
Stage 2	-	-	-	-	~ 113	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.3	0		\$ 1894.2		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1052	-	-	-	17	557
HCM Lane V/C Ratio	0.435	-	-	-	9.78	0.397
HCM Control Delay (s)	11	-	-	-	\$ 4391.2	15.6
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	2.2	-	-	-	21.6	1.9
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	5.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	48	35	194	284	175	360
Future Vol, veh/h	48	35	194	284	175	360
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	65	50	89	86	94	91
Heavy Vehicles, %	10	7	1	1	0	2
Mvmt Flow	74	70	218	330	186	396
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1151	383	0	0	548	0
Stage 1	383	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Critical Hdwy	6.5	6.27	-	-	4.1	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.363	-	-	2.2	-
Pot Cap-1 Maneuver	211	654	-	-	1032	-
Stage 1	672	-	-	-	-	-
Stage 2	444	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	162	654	-	-	1032	-
Mov Cap-2 Maneuver	162	-	-	-	-	-
Stage 1	517	-	-	-	-	-
Stage 2	444	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	35.7	0	3			
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	256	1032	-	
HCM Lane V/C Ratio	-	-	0.562	0.18	-	
HCM Control Delay (s)	-	-	35.7	9.3	0	
HCM Lane LOS	-	-	E	A	A	
HCM 95th %tile Q(veh)	-	-	3.1	0.7	-	

Intersection												
Int Delay, s/veh	7.5											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	213	0	0	0	0	0	0	0	0	151	0
Future Vol, veh/h	0	213	0	0	0	0	0	0	0	0	151	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	86	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	7	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	248	0	0	0	0	0	0	0	0	176	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	176	-	-	176	-	-	0	-	-	-	0
Stage 1	-	0	-	-	176	-	-	-	-	-	-	-
Stage 2	-	176	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.57	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.57	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.063	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	709	0	0	717	0	0	-	0	0	-	0
Stage 1	0	-	0	0	753	0	0	-	0	0	-	0
Stage 2	0	744	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	709	-	-	717	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	709	-	-	717	-	-	-	-	-	-	-
Stage 1	-	-	-	-	753	-	-	-	-	-	-	-
Stage 2	-	744	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	12.8		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	- 709		-		-							
HCM Lane V/C Ratio	- 0.349		-		-							
HCM Control Delay (s)	- 12.8		0		-							
HCM Lane LOS	- B		A		-							
HCM 95th %tile Q(veh)	- 1.6		-		-							

Intersection												
Int Delay, s/veh	7.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	288	0	0	0	0	0	0	0	0	151	0
Future Vol, veh/h	0	288	0	0	0	0	0	0	0	0	151	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	85	92	92	92	92	92	92	92	92	86	92
Heavy Vehicles, %	2	0	2	2	2	2	2	2	2	2	7	2
Mvmt Flow	0	339	0	0	0	0	0	0	0	0	176	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	176	-	-	176	-	-	0	-	-	-	0
Stage 1	-	176	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	176	-	-	-	-	-	-	-
Critical Hdwy	-	6.5	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.5	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	721	0	0	717	0	0	-	0	0	-	0
Stage 1	0	757	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	753	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	721	-	-	717	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	721	-	-	717	-	-	-	-	-	-	-
Stage 1	-	757	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	753	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	11.5		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT EBLn1		EBLn2WBLn1		WBLn2 SBT							
Capacity (veh/h)	- 721		721		- -		-					
HCM Lane V/C Ratio	- 0.235		0.235		- -		-					
HCM Control Delay (s)	- 11.5		11.5		0 0		-					
HCM Lane LOS	- B		B		A A		-					
HCM 95th %tile Q(veh)	- 0.9		0.9		- -		-					

Intersection						
Int Delay, s/veh	17.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	288	0	0	0	0	597
Future Vol, veh/h	288	0	0	0	0	597
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	92	92	92	92	85
Heavy Vehicles, %	0	2	2	2	2	2
Mvmt Flow	339	0	0	0	0	702
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	-	-	-	170
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	844
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	-	-	-	844
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		26.5	
HCM LOS					D	
Minor Lane/Major Mvmt	NBLn1		EBT	WBT		
Capacity (veh/h)	844		-	-		
HCM Lane V/C Ratio	0.832		-	-		
HCM Control Delay (s)	26.5		-	-		
HCM Lane LOS	D		-	-		
HCM 95th %tile Q(veh)	9.6		-	-		

Intersection												
Int Delay, s/veh	10											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔	↗		↔↔			↗			↗	↗
Traffic Vol, veh/h	7	18	176	0	284	1	124	23	0	1	46	23
Future Vol, veh/h	7	18	176	0	284	1	124	23	0	1	46	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	300	-	-	-	-	-	-	-	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	81	78	97	90	25	90	57	39	25	62	50
Heavy Vehicles, %	0	8	0	0	1	0	0	13	0	0	6	0
Mvmt Flow	11	22	226	0	316	4	138	40	0	4	74	46
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	558	398	74	-	398	40	74	0	-	40	0	0
Stage 1	82	82	-	-	316	-	-	-	-	-	-	-
Stage 2	476	316	-	-	82	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.58	6.2	-	6.51	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.58	-	-	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.072	3.3	-	4.009	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	443	530	993	0	541	1037	1538	-	0	1583	-	-
Stage 1	931	815	-	0	657	-	-	-	0	-	-	-
Stage 2	574	644	-	0	829	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	200	480	993	-	490	1037	1538	-	-	1583	-	-
Mov Cap-2 Maneuver	200	480	-	-	490	-	-	-	-	-	-	-
Stage 1	845	813	-	-	597	-	-	-	-	-	-	-
Stage 2	245	585	-	-	827	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10.6		15.7		5.9		0.2					
HCM LOS	B		C									
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1538	-	282	480	993	490	496	1583	-	-		
HCM Lane V/C Ratio	0.09	-	0.079	0.023	0.227	0.322	0.326	0.003	-	-		
HCM Control Delay (s)	7.6	0	18.9	12.7	9.7	15.8	15.7	7.3	-	-		
HCM Lane LOS	A	A	C	B	A	C	C	A	-	-		
HCM 95th %tile Q(veh)	0.3	-	0.3	0.1	0.9	1.4	1.4	0	-	-		

Intersection						
Int Delay, s/veh	369.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	80	336	1174	211	287	412
Future Vol, veh/h	80	336	1174	211	287	412
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yield	-	Stop
Storage Length	100	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	83	95	79	79	90
Heavy Vehicles, %	0	3	1	1	2	0
Mvmt Flow	110	405	1236	267	363	458
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1236	0	-	0	1861	1236
Stage 1	-	-	-	-	1236	-
Stage 2	-	-	-	-	625	-
Critical Hdwy	4.1	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.2	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	571	-	-	-	~ 80	~ 217
Stage 1	-	-	-	-	~ 274	-
Stage 2	-	-	-	-	534	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	571	-	-	-	~ 65	~ 217
Mov Cap-2 Maneuver	-	-	-	-	~ 65	-
Stage 1	-	-	-	-	~ 221	-
Stage 2	-	-	-	-	534	-
Approach	EB	WB		SB		
HCM Control Delay, s	2.7	0		\$ 1276.4		
HCM LOS	F					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	571	-	-	-	65	217
HCM Lane V/C Ratio	0.192	-	-	-	5.589	2.11
HCM Control Delay (s)	12.8	-	-		\$ 2190.9	\$ 550.7
HCM Lane LOS	B	-	-	-	F	F
HCM 95th %tile Q(veh)	0.7	-	-	-	40.6	35
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	106.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	102	382	503	38	21	146
Future Vol, veh/h	102	382	503	38	21	146
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	73	81	78	50	74
Heavy Vehicles, %	0	0	1	3	6	2
Mvmt Flow	111	523	621	49	42	197
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	927	646	0	0	670	0
Stage 1	646	-	-	-	-	-
Stage 2	281	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.16	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.254	-
Pot Cap-1 Maneuver	300	~ 475	-	-	902	-
Stage 1	526	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	284	~ 475	-	-	902	-
Mov Cap-2 Maneuver	284	-	-	-	-	-
Stage 1	499	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	258.2	0		1.6		
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	425	902	-	
HCM Lane V/C Ratio	-	-	1.492	0.047	-	
HCM Control Delay (s)	-	-	258.2	9.2	0	
HCM Lane LOS	-	-	F	A	A	
HCM 95th %tile Q(veh)	-	-	33.3	0.1	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection												
Int Delay, s/veh	3.9											
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	0	147	0	0	0	0	0	0	0	0	535	0
Future Vol, veh/h	0	147	0	0	0	0	0	0	0	0	535	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	94	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	156	0	0	0	0	0	0	0	0	594	0
Major/Minor	Minor1		Minor2		Major1		Major2					
Conflicting Flow All	-	594	-	-	594	-	-	0	-	-	-	0
Stage 1	-	0	-	-	594	-	-	-	-	-	-	-
Stage 2	-	594	-	-	0	-	-	-	-	-	-	-
Critical Hdwy	-	6.52	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.52	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.018	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	418	0	0	418	0	0	-	0	0	-	0
Stage 1	0	-	0	0	493	0	0	-	0	0	-	0
Stage 2	0	493	0	0	-	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	418	-	-	418	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	418	-	-	418	-	-	-	-	-	-	-
Stage 1	-	-	-	-	493	-	-	-	-	-	-	-
Stage 2	-	493	-	-	-	-	-	-	-	-	-	-
Approach	NB		SB		NE		SW					
HCM Control Delay, s	18.7		0		0		0					
HCM LOS	C		A									
Minor Lane/Major Mvmt	NET NBLn1		SBLn1		SWT							
Capacity (veh/h)	- 418		- -		-							
HCM Lane V/C Ratio	- 0.374		-		-							
HCM Control Delay (s)	- 18.7		0		-							
HCM Lane LOS	- C		A		-							
HCM 95th %tile Q(veh)	- 1.7		-		-							

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	16	0	0	0	0	0	0	0	0	535	0
Future Vol, veh/h	0	16	0	0	0	0	0	0	0	0	535	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	81	92	92	92	92	92	92	92	92	90	92
Heavy Vehicles, %	2	8	2	2	2	2	2	2	2	2	1	2
Mvmt Flow	0	20	0	0	0	0	0	0	0	0	594	0
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	594	-	-	594	-	-	0	-	-	-	0
Stage 1	-	594	-	-	0	-	-	-	-	-	-	-
Stage 2	-	0	-	-	594	-	-	-	-	-	-	-
Critical Hdwy	-	6.58	-	-	6.52	-	-	-	-	-	-	-
Critical Hdwy Stg 1	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	5.58	-	-	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	-	4.072	-	-	4.018	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	0	410	0	0	418	0	0	-	0	0	-	0
Stage 1	0	484	0	0	-	0	0	-	0	0	-	0
Stage 2	0	-	0	0	493	0	0	-	0	0	-	0
Platoon blocked, %												
Mov Cap-1 Maneuver	-	410	-	-	418	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	410	-	-	418	-	-	-	-	-	-	-
Stage 1	-	484	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	493	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	14		0		0		0					
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBT		EBLn1		EBLn2WBLn1WBLn2		SBT					
Capacity (veh/h)	-		410		410		-		-		-	
HCM Lane V/C Ratio	-		0.024		0.024		-		-		-	
HCM Control Delay (s)	-		14		14		0		0		-	
HCM Lane LOS	-		B		B		A		A		-	
HCM 95th %tile Q(veh)	-		0.1		0.1		-		-		-	

Intersection

Int Delay, s/veh 7.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
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Lane Configurations

Traffic Vol, veh/h	16	0	0	0	0	119
Future Vol, veh/h	16	0	0	0	0	119
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	92	92	92	92	94
Heavy Vehicles, %	8	2	2	2	2	2
Mvmt Flow	20	0	0	0	0	127

Major/Minor	Major1	Major2	Minor1
-------------	--------	--------	--------

Conflicting Flow All	0	-	-	-	-	10
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	0	0	-	0	1069
Stage 1	-	0	0	-	0	-
Stage 2	-	0	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	1069
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
----------	----	----	----

HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	WBT
-----------------------	-------	-----	-----

Capacity (veh/h)	1069	-	-
HCM Lane V/C Ratio	0.118	-	-
HCM Control Delay (s)	8.8	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-

Appendix C-11

2012 – 2016 MassDOT Crash Worksheets

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Lincoln COUNT DATE : April 5, 2018

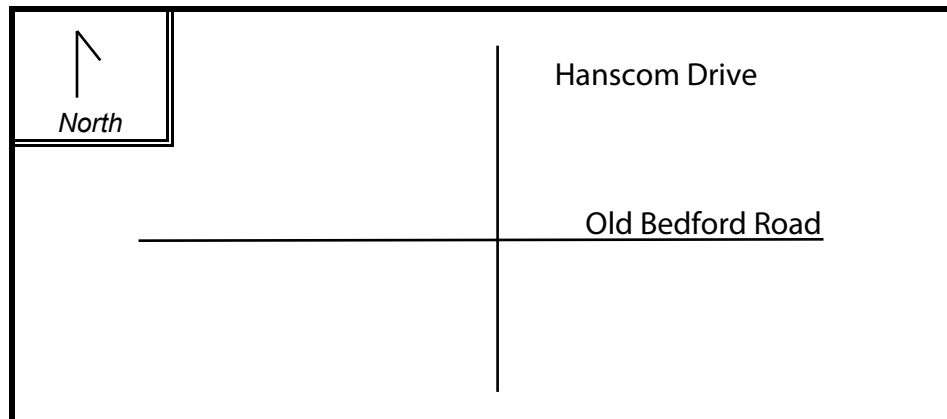
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Hanscom Drive

MINOR STREET(S) : Old Bedford Road

**INTERSECTION
DIAGRAM**
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB	EB		
PEAK HOURLY VOLUMES (AM/PM) :	212	58	621	169		1,060

" K " FACTOR :

0.09

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :

11,777

TOTAL # OF CRASHES :

3

OF YEARS :

5

AVERAGE # OF CRASHES PER YEAR (**A**) :

0.6

CRASH RATE CALCULATION :

0.14

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : _____

Project Title & Date : Hanscom 2017 ESPR

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Lincoln COUNT DATE : April 5, 2018

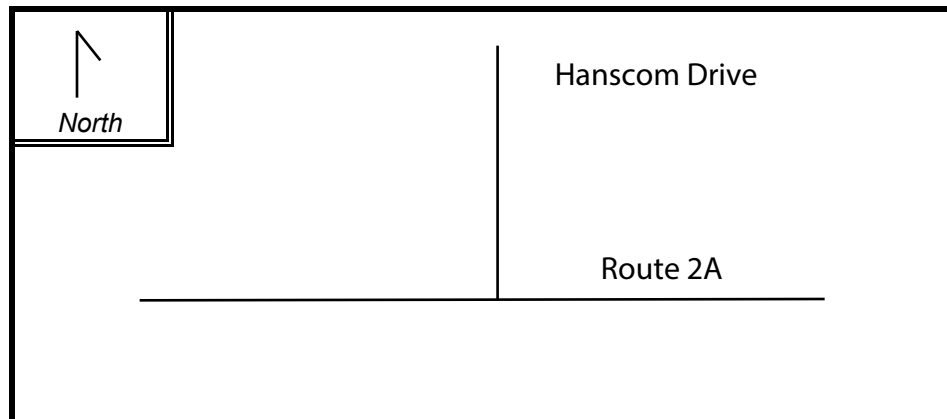
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Route 2A

MINOR STREET(S) : Hanscom Drive

**INTERSECTION
DIAGRAM**
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	SB	WB	EB			
PEAK HOURLY VOLUMES (AM/PM) :	548	1,217	365			2,130

" K " FACTOR : INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES : # OF YEARS : AVERAGE # OF CRASHES PER YEAR (**A**) :

CRASH RATE CALCULATION :

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : _____

Project Title & Date : Hanscom 2017 ESPR

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Concord COUNT DATE : April 5, 2018

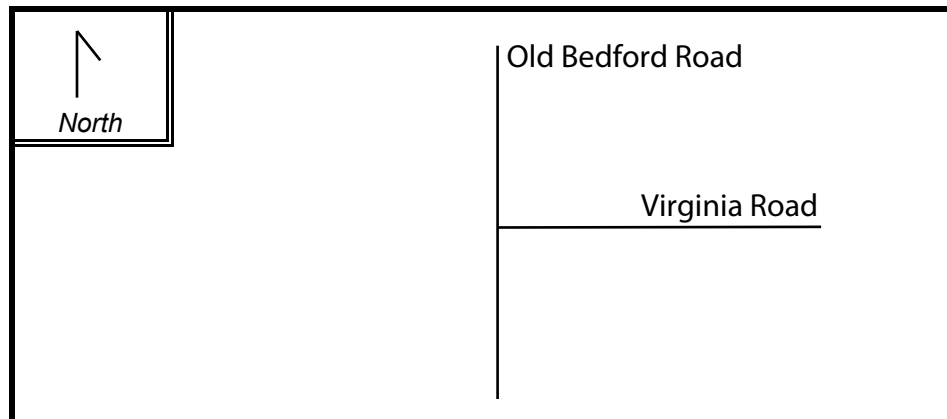
DISTRICT : 4 UNSIGNALIZED : ☒ SIGNALIZED : ☐

~ INTERSECTION DATA ~

MAJOR STREET : Old Bedford Road

MINOR STREET(S) : Virginia Road

**INTERSECTION
DIAGRAM**
(Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	WB			
PEAK HOURLY VOLUMES (AM/PM) :	479	147	392			1,018

" K " FACTOR :

0.14

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :

7,271

TOTAL # OF CRASHES :

1

OF YEARS :

5

AVERAGE # OF CRASHES PER YEAR (**A**) :

0.2

CRASH RATE CALCULATION :

0.08

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : _____

Project Title & Date : Hanscom 2017 ESPR

Appendix C-12

Count data for 2017 on I-95 at Route 2A

ADT by Day of Week by Month for 1/1/2017 - 12/31/2017

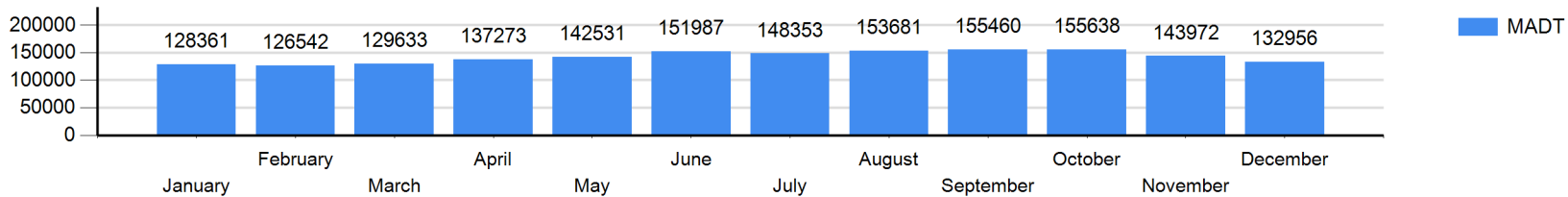
District
Community Lexington
County Middlesex
Factor Group U1-Boston

Location ID H8509
Direction 2-WAY
RoadBed ML

Located On YANKEE DIVISION HIGHWAY
AADT 143113
Collection Type SAS 1
Functional Class (1) Interstate

	Average Daily Number of Vehicles							Avg. Day (Mon-Sun)	Avg. Day as % of Year Avg.	Avg. Weekday (Mon-Thu)	Avg. Day as % of Avg. Weekday (Mon-Thu)	Avg. Weekday (Mon-Fri)	Avg. Day as % of Avg. Weekday (Mon-Fri)
	Sun	Mon	Tue	Wed	Thu	Fri	Sat						
JAN	95,650	126,534	140,371	138,888	151,252	142,788	103,050	128,361	90.27%	139,261	92.17%	139,967	91.71%
FEB	97,863	134,703	144,218	143,533	116,940	134,634	113,909	126,542	88.99%	134,849	93.84%	134,806	93.87%
MAR	100,569	138,423	117,576	140,930	151,637	142,198	116,103	129,633	91.16%	137,142	94.52%	138,153	93.83%
APR	115,521	145,969	147,821	139,392	147,270	146,419	118,528	137,273	96.54%	145,113	94.60%	145,374	94.43%
MAY	114,207	128,040	152,434	159,202	162,601	148,500	132,740	142,531	100.23%	150,569	94.66%	150,155	94.92%
JUN	130,502	155,065	157,146	160,108	164,819	158,857	137,416	151,987	106.88%	159,285	95.42%	159,199	95.47%
JUL	124,474	151,394	146,176	160,594	166,069	156,146	133,620	148,353	104.33%	156,058	95.06%	156,076	95.05%
AUG	126,176	157,761	162,659	165,936	167,225	159,455	136,561	153,681	108.07%	163,395	94.05%	162,607	94.51%
SEP	130,721	159,957	162,852	162,961	166,495	163,859	141,384	155,460	109.33%	163,066	95.34%	163,225	95.24%
OCT	127,103	153,739	161,988	165,803	166,872	167,525	146,444	155,638	109.45%	162,101	96.01%	163,185	95.37%
NOV	110,084	152,220	159,716	156,492	154,235	147,490	127,569	143,972	101.25%	155,666	92.49%	154,031	93.47%
DEC	94,984	130,550	144,699	158,365	149,701	141,703	110,699	132,956	93.50%	145,829	91.17%	145,004	91.69%
Year	113,988	144,530	149,805	154,350	155,426	150,798	126,502	142,199		151,028	94.15%	150,982	94.18%

MADT By Month



NOTE: VALUES ARE ROUNDED; TOTALS AND PERCENTS MAY NOT ADD UP.

Appendix C-13

Trip Generation, Assignment, and Distribution Estimation Procedures

Hanscom Drive Volume Adjustment

In order to accurately report Hanscom Field trip generation, a review of peak hour counts on the Automatic Traffic Recorder were compared for the week of Thursday, April 5, 2018 through Wednesday, April 11, 2018. Since trip generation numbers are primarily derived from turning counts at Hanscom Drive and Old Bedford Road, every effort was taken to accurately report Hanscom Field trip distribution. Since the morning peak hour at the Hanscom Drive and Old Bedford intersection was reported as 7:30 – 8:30 AM and the afternoon peak hour was reported as 3:45 – 4:45 PM, review of counts during this time frame were reviewed. As the turning counts were completed on April 5, 2018, a review of this count versus the counts by the average Tuesday, Wednesday, Thursday count completed by the ATR resulted in an increase in the Hanscom Field trips between 13 and 23%. These adjustments are made on all figures throughout the 2017 ESPR, however, these adjustments were not followed through to subsequent intersections.

	IN		OUT	
	AM (7:30 - 8:30 AM)	PM (3:45 - 4:45 PM)	AM (7:30 - 8:30 AM)	PM (3:45 - 4:45 PM)
<i>Thursday, April 5, 2018</i>	<i>50</i>	<i>23</i>	<i>22</i>	<i>54</i>
Friday, April 6, 2018	81	27	31	54
Saturday, April 7, 2018	41	21	10	27
Sunday, April 8, 2018	27	18	4	25
<i>Monday, April 9, 2018</i>	<i>67</i>	<i>29</i>	<i>48</i>	<i>64</i>
<i>Tuesday, April 10, 2018</i>	<i>62</i>	<i>30</i>	<i>30</i>	<i>69</i>
Wednesday, April 11, 2018	58	32	27	63
Tu/W/Th Average	57	28	26	62
Count Day Adjustment	1.13	1.23	1.20	1.15

Rectrix Aviation Facility

The completion of the Rectrix Aviation facility on Virginia Road in the Pine Hill area of Hanscom Field since the 2012 ESPR has resulted in an increased vehicle trips related to Hanscom Field via access points on Virginia Road. Thus, aviation related trips which may have previously exclusively used the Hanscom Drive access may now access Hanscom Field via Virginia Road as well. However, the 2017 ESPR count program did not include any counts of Rectrix Aviation facility. With this being the case, the 2017 ESPR estimates the peak hour trip generation in the Pine Hill area utilizing parking occupancy counts completed on April 12, 2018, given the following relationship:

$$Peak\ Hour\ Trip\ Gen_{(Rectrix)} = \frac{Parked\ Vehicles_{(Rectrix)}}{Parked\ Vehicles_{(Terminal\ Area)}} * Peak\ Hour\ Trip\ Gen_{(Terminal\ Area)}$$

Given that the parking occupancy count indicates that 52 vehicles were parked at the Rectrix Aviation Facility and 415 vehicles were parked at the Terminal Area (all parking lots accessed by Hanscom Drive), roughly 12.5% of the trip generation observed at the Terminal Area access were applied to the Rectrix Aviation Facility. This results in the following table:

	Hanscom Drive Peak Hour Trip Generation	Rectrix Facility Estimate (12.5% of Hanscom Drive Traffic)	Total Peak Hour Trip Generation
2018 AM PEAK ENTER:	66	8	74
2018 AM PEAK EXIT:	32	4	36
2018 PM PEAK ENTER:	28	4	32
2018 PM PEAK EXIT:	67	8	75

It is recommended that with further development planned outside the terminal area, future ESPR reports conduct traffic volume counts at other Hanscom Field access points.

Trip Generation Estimation Procedures

As aviation use similar to that found at Hanscom Field is not a standard use in the *Institute of Transportation Trip Generation Manual*, the 2017 ESPR utilized the trip generation model from the 2012 ESPR. Unlike the 2012 ESPR, the 2017 ESPR does not add expected vehicle trips from either a hotel or aviation museum. Thus, the 2017 ESPR is a composite of 3 factors; 1) general aviation, 2) commercial aviation, and 3) other trips due to non-aviation uses. The following describe the process to estimate trip generation for the 2017 ESPR.

Trip Generation Rates from Aviation

Using the 2012 ESPR trip generation estimates, the following rates for general aviation and commercial aviation were determined:

Use	AM		PM		Unit
	IN	OUT	IN	OUT	
GA	2.89	0.96	1.79	2.81	Per 10k Annual Operations
Comm	2.93	2.93	2.28	0.57	Per 10k Annual Passengers

Trip Generation due to Aviation

Using the rates determined above, trip generation due to aviation were estimated as follows:

	Morning Peak Hour			Afternoon Peak Hour		
	IN	OUT	TOTAL	IN	OUT	TOTAL
2017 ESPR Existing Trip Generation from Aviation						
General Aviation	37	12	49	23	36	59
Commercial	0	0	0	0	0	0
Total	37	12	49	23	36	59
2025 Forecast Trip Generation from Aviation						
General Aviation	38	13	51	24	37	61
Commercial	7	6	13	5	1	6
Total	45	19	64	29	38	67
2035 Forecast Trip Generation from Aviation						
General Aviation	40	13	53	25	39	64
Commercial	13	13	26	10	3	13
Total	53	26	79	35	42	77

2017 ESPR Trip Generation due to Other Uses

In order to estimate trip generation due to other uses, the following process was followed: 1) balanced 2017 ESPR Existing Trip Generation Volumes and assigned these trips to the other use, 2) grew these trips in the 2025 and 2035 forecast year based on the proportional growth in the aviation related trips. A summary is provided below:

	Morning Peak Hour			Afternoon Peak Hour		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Total 2017 ESPR Trip Generation	74	36	110	32	75	107
LESS (Total Trip Generation from Aviation)	37	12	49	23	36	59
Estimated 2017 ESPR Trip Generation from Other Uses	37	24	61	9	39	48

Growth in Trip Generation due to Aviation

In order to grow the trip generation from other uses, the growth in trip generation due to aviation was determined as follows:

	AM Total	PM Total	Total	Ratio compared to Existing Trip Generation
2017 ESPR	49	59	108	1.00
2025 Forecast	64	67	131	1.21
2035 Forecast	79	77	156	1.44

Future Trip Generation Due to Other Uses

Utilizing the trip growth due to aviation, the following trip generation forecast for other uses is calculated:

	Morning Peak Hour			Afternoon Peak Hour		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Estimated 2017 ESPR Trip Generation from Other Uses	37	24	61	9	39	48
2025 Forecast Trip Generation from Other Uses	45	29	74	11	47	58
2035 Forecast Trip Generation from Other Uses	53	35	88	13	56	69

Final Trip Generation Table

Thus, a final trip generation table reflecting peak hour trips due to both aviation and other uses is compiled. This is seen below:

	Morning Peak Hour			Afternoon Peak Hour		
	IN	OUT	TOTAL	IN	OUT	TOTAL
2017 ESPR Existing Trip Generation from Aviation						
General Aviation	37	12	49	23	36	59
Commercial	0	0	0	0	0	0
Other	37	24	61	9	39	48
Total	74	36	110	32	75	107
2025 Forecast Trip Generation from Aviation						
General Aviation	38	13	51	24	37	61
Commercial	7	6	13	5	1	6
Other	45	29	74	11	47	58
Total	90	48	138	40	85	125
2035 Forecast Trip Generation from Aviation						
General Aviation	40	13	53	25	39	64
Commercial	13	13	26	10	3	13
Other	53	35	88	13	56	69
Total	106	61	167	48	98	146

Trip Assignment to Hanscom Field Driveways

In recognition that the 2017 ESPR expects a continued trend in the development outside the Terminal area, it is necessary to show future traffic volumes at the Pine Hill and the North Airfield access points. While the 2012 ESPR elected to apply all trips to the main access at Hanscom Drive, development as described in Chapter 4 of the 2017 ESPR shows that a notable proportion of aviation uses will be developed on the Pine Hill and North Airfield sectors of the airport. Distribution assumptions are documented in Chapter 6, with these assumptions resulting in the following table which details estimated peak hour trip generation by driveway.

	Morning Peak Hour			Afternoon Peak Hour		
	IN	OUT	TOTAL	IN	OUT	TOTAL
2017 ESPR Existing Trip Generation from Aviation						
Pine Hill	8	4	12	4	8	12
North Airfield	0	0	0	0	0	0
Terminal Area	66	32	98	28	67	95
Total	74	36	110	32	75	107
2025 Forecast Trip Generation from Aviation						
Pine Hill	14	6	20	7	14	21
North Airfield	8	3	11	5	7	12
Terminal Area	68	39	107	28	64	92
Total	90	48	138	40	85	125
2035 Forecast Trip Generation from Aviation						
Pine Hill	18	9	27	11	18	29
North Airfield	10	3	13	6	10	16
Terminal Area	78	49	127	31	70	101
Total	106	61	167	48	98	146

Trip Distribution Estimation for Pine Hill and North Airfield

As discussed throughout Chapter 6 of the 2017 ESPR, Hanscom Field trips destined to and originating from the main access point at Hanscom Drive were distributed based on observed traffic behavior at main intersections studied. In the case of the additional driveways studied, effort to maintain travel behavior as indicated by traffic out of the Terminal Area Access at Hanscom Drive was maintained. This was completed through the following approaches.

Pine Hill Access

Access to and from facilities on Pine Hill (such as the Rectrix facility) were distributed in the same manner as traffic volume at Hanscom Drive. However, traffic between Hanscom Drive and Hanscom Air Force Base were disregarded.

North Airfield Access

Traffic was assumed to access North Airfield access through three entries on the network: 1) from the east with access from Exit 31 on I-95 via Route 4/225 and South Road, 2) from the north with access to Bedford Center via Route 62 from the north, and 3) from the south and points west via Route 62 towards Lincoln Center. Trips were distributed to these access points proportional to the manner calculated for the 2018 existing conditions for Hanscom Traffic.

Appendix D — Noise

D.1 Noise Effects

This section addresses the primary ways people are affected by aircraft noise: annoyance, sleep disturbance, and speech interference.

D.1.1 Annoyance

Social survey data have long made it clear that individual reactions to noise vary widely for a given noise level. Nevertheless, as a group, people's aggregate response to factors such as speech and sleep interference and desire for an acceptable environment is predictable and relates well to measures of cumulative noise exposure such as DNL. A wide variety of responses have been investigated in social survey research. The concept of "percent highly annoyed" in sample populations seems to provide the most consistent response of a community to a particular noise source (see Figure D-1).

The most widely recognized relationship between noise and annoyance – regardless of the noise source – was developed by Schultz in the late 1970s. This relationship or the "Schultz Curve" is shown in Figure D-2. Schultz based his analysis on data from 18 surveys conducted worldwide; the curve indicates that at levels as low as 55 dB DNL, approximately five percent of the people will still be highly annoyed, with the percentage increasing more rapidly as exposure increases above 65 dB DNL¹. Separate work by the EPA has shown that overall community reaction to a noise environment is also dependent on DNL².

The most recent analysis of community annoyance (1989) supports the conclusions set forth by Schultz; that is, that the DNL-%HA relationship presented in the "Schultz curve" is applicable to all transportation noise. This analysis included Schultz' original data (161 points) and added to it data from more recent social surveys (269 points). A logistic regression of the relationship is shown in Figure D-3. This is the preferred relationship for current investigations³. The more recent analysis also showed that communities near airports are slightly more willing to describe

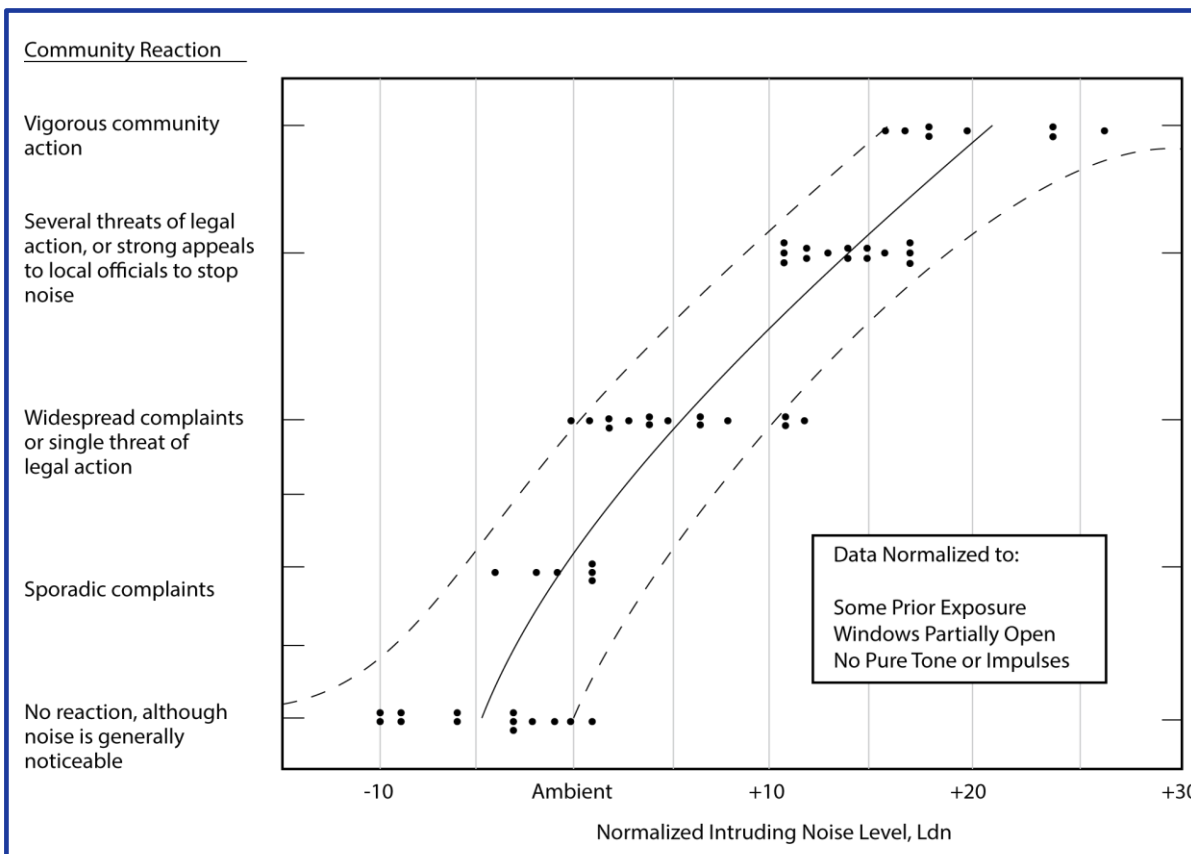
¹ Schultz, T.J., "Synthesis of Social Surveys on Noise Annoyance", Journal of the Acoustical Society of America, Vol. 64, No. 2, August 1978.

² Wyle Labs, Community Noise, DOT Report NTID300.3, December, 1971.

³ FICON 1992. Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Analysis Issues, August, 1992.

themselves as annoyed than those near surface transportation noise sources, although there are no statistically significant differences between modes of transportation⁴.

Figure D-1 Community reaction as a function of outdoor noise level



Source: Wyle Laboratories, "Community Noise," prepared for the U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., December 1971, pg. 63

D.1.2 Speech Interference

One of the primary effects of aircraft noise is its tendency to drown out or "mask" speech, making it difficult or impossible to carry on a normal conversation without interruption. The sound level of speech decreases as distance between a talker and listener increases. As the level of speech decreases in the presence of background noise, it becomes harder and harder to hear. Figure D-4 presents typical distances between talker and listener for satisfactory

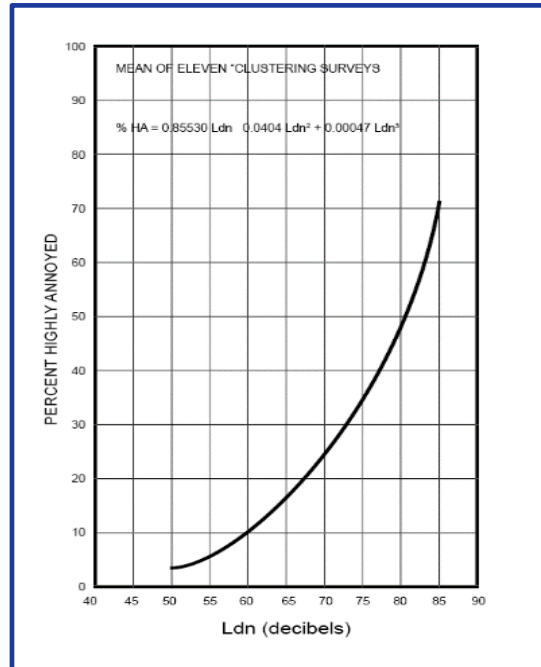
⁴ Fidell, S., Barber, D., and Schultz., Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise, HSD-TR-89-009, Wright-Patterson AFB, Ohio: US Air Force, Noise and Sonic Boom Impact Technology.

outdoor conversations in the presence of different steady A-weighted background noise normal, and relaxed⁵. As the background level increases, the talker must raise his/her voice, or the individuals must get closer together to continue their conversation.

As indicated in Figure D-4, satisfactory conversation does not always require hearing every word; 95 percent intelligibility is acceptable for many conversations. This is because a few unheard words can be inferred when they occur in a familiar context. However, in relaxed conversation, we have higher expectations of hearing speech and require complete 100 percent intelligibility. Any combination of talker-listener distances and background noise that falls below the bottom line in the figure represents an ideal environment for outdoor speech communication and is considered necessary for acceptable indoor conversation as well.

One implication of the relationships in the figure is that for typical communication distances of three or four feet (one to one and one-half meters), acceptable outdoor conversations where 95 percent intelligibility is acceptable can be carried on in a normal voice as long as the background noise outdoors is less than about 65 dB(A). If 100 percent intelligibility is desired, the interior background level must be less than about 45 dB(A). If the noise exceeds either of these levels, as might occur when an aircraft passes overhead, intelligibility is lost unless vocal effort is increased or communication distance decreased.

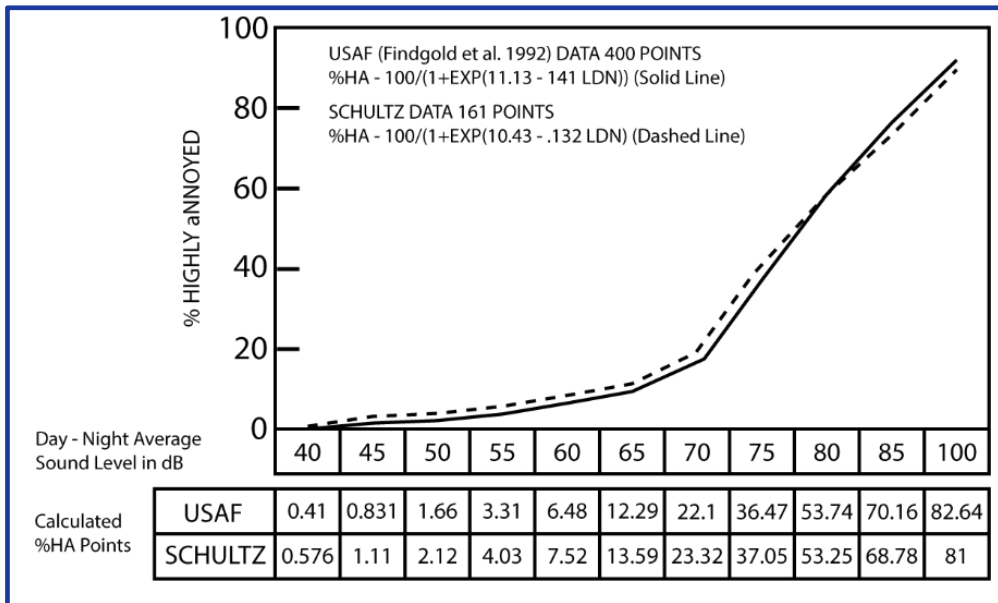
Figure D-2 Percentage of People Highly Annoyed as a Function of Exposure



Source: Schultz, 1978

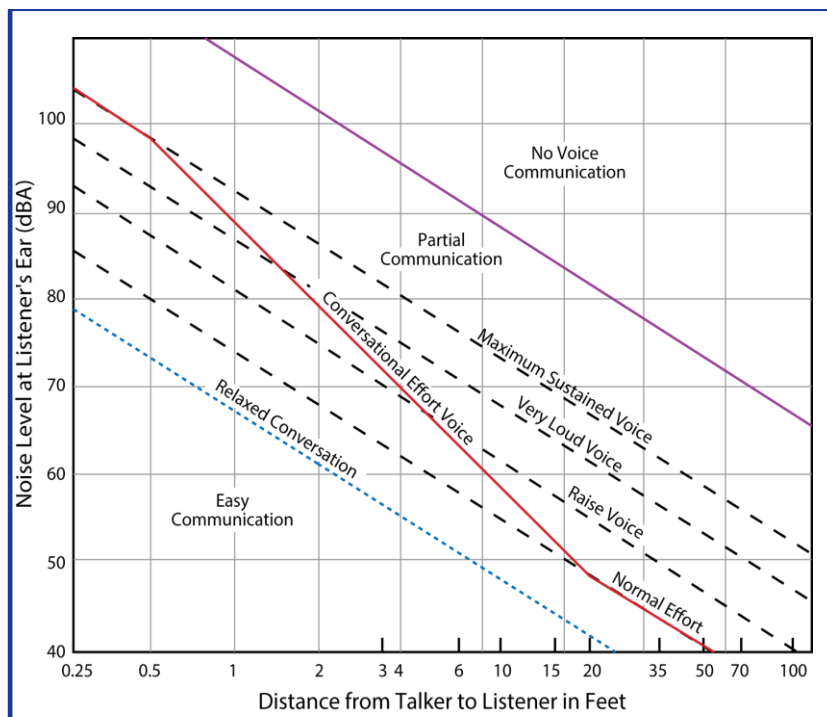
⁵ United States Environmental Protection Agency, Public Health and Welfare Criteria for Noise, 1973.

Figure D-4 Comparison of Schultz Data (1978) and USAF Data (1992) on Annoyance



Source: FICON. "Federal Agency Review of Selected Airport Noise Analysis Issues." August 1992. (From data provided by USAF Armstrong Laboratory). pp. 3-6.

Figure D-3 Distances at Which Ordinary Speech Can be Understood



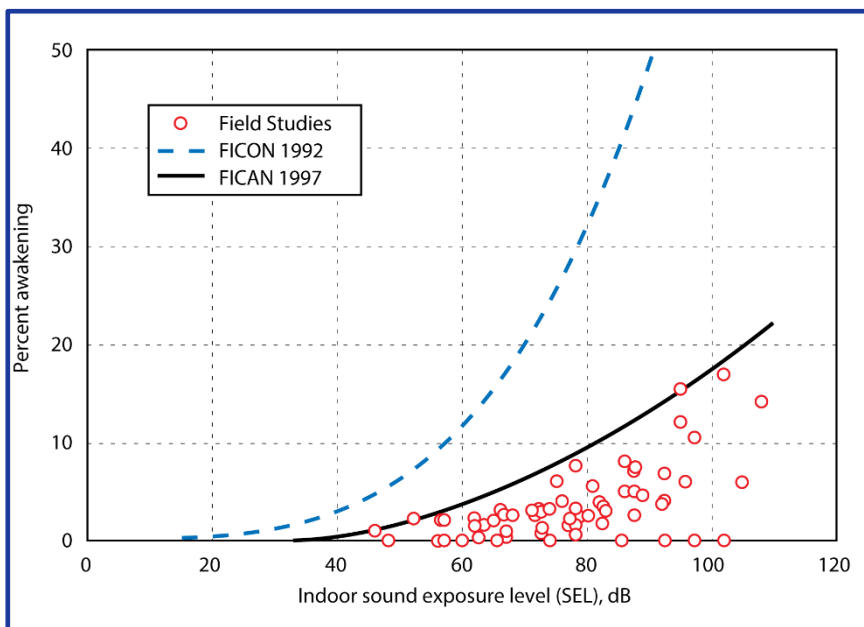
Source: U.S. EPA, 1973

D.1.3 Sleep Interference

The effect of aviation noise on sleep is a long-recognized concern of those interested in addressing the impacts of noise on people. Historical studies of sleep disturbance were conducted mainly in laboratories, using various indicators of response (electroencephalographic recordings, verbal response, button push, etc.). Field studies also were conducted, in which subjects were exposed to noise in their own homes, using real or simulated noise. However, in a 1989 assessment of existing research, Pearsons indicated the need for substantially more work in this area, citing the large discrepancy between laboratory and field studies as a major concern.

In 1992, the Federal Interagency Committee on Noise (FICON) recommended an interim dose-response curve to predict the percent of the exposed population expected to be awakened

Figure D-5 Recommended Sleep Disturbance Dose-Response Relationship



(percent awakening) as a function of the exposure to single event noise levels expressed in terms of sound exposure level (SEL)⁶. This interim curve was based on the data presented in the 1989 study. The FICON report also recommended continued research into community reactions to aircraft noise, including sleep disturbance.

Since the adoption of FICON's interim curve in 1992, substantial field

research in the area of sleep disturbance was conducted, using a variety of test methods, and in a number of locations. The data from these studies show a consistent pattern, with considerably less percent of the exposed population expected to be behaviorally awakened than had been shown with laboratory studies. In 1997, FICAN recommended a new dose-

⁶ FICON 1992

response curve for predicting awakening, based on the results of the field studies described above⁷. This curve is presented in Figure D-5. Because the curve represents the upper limit of the data, it should be interpreted as predicting the “maximum percent of the exposed population expected to be behaviorally awakened”, or the “maximum % awakened”. The dose-response relationship presented here relies on behavioral awakening as the indicator of sleep disturbance; relationships between aircraft noise and other potential sleep disturbance or related health effects responses have not been established by any of these newer studies. This curve should be applied only to long-term residential settings and should not be generalized to include children.

The finding on the relationship between aircraft noise and sleep disturbance does not call into question the nighttime penalty applied to Day Night Sound Level (DNL). The 10 dB penalty added to noise levels for the period 10:00 p.m. to 7:00 a.m. is intended to account for the increased intrusiveness of noise at night. The ambient is generally lower and more people are at home during this period than at other times of the day. Thus, the opportunities for activity interference are much higher during nighttime, which could lead to greater annoyance.

D.2 Noise Prediction Methodology

This section provides supplemental information on the noise prediction methodology described in Chapter 7. It specifically addresses the process used to develop AEDT flight tracks from radar data, the detailed aircraft operations input, and methodology used to assess the population within various noise contour intervals.

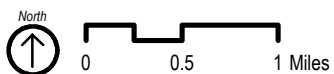
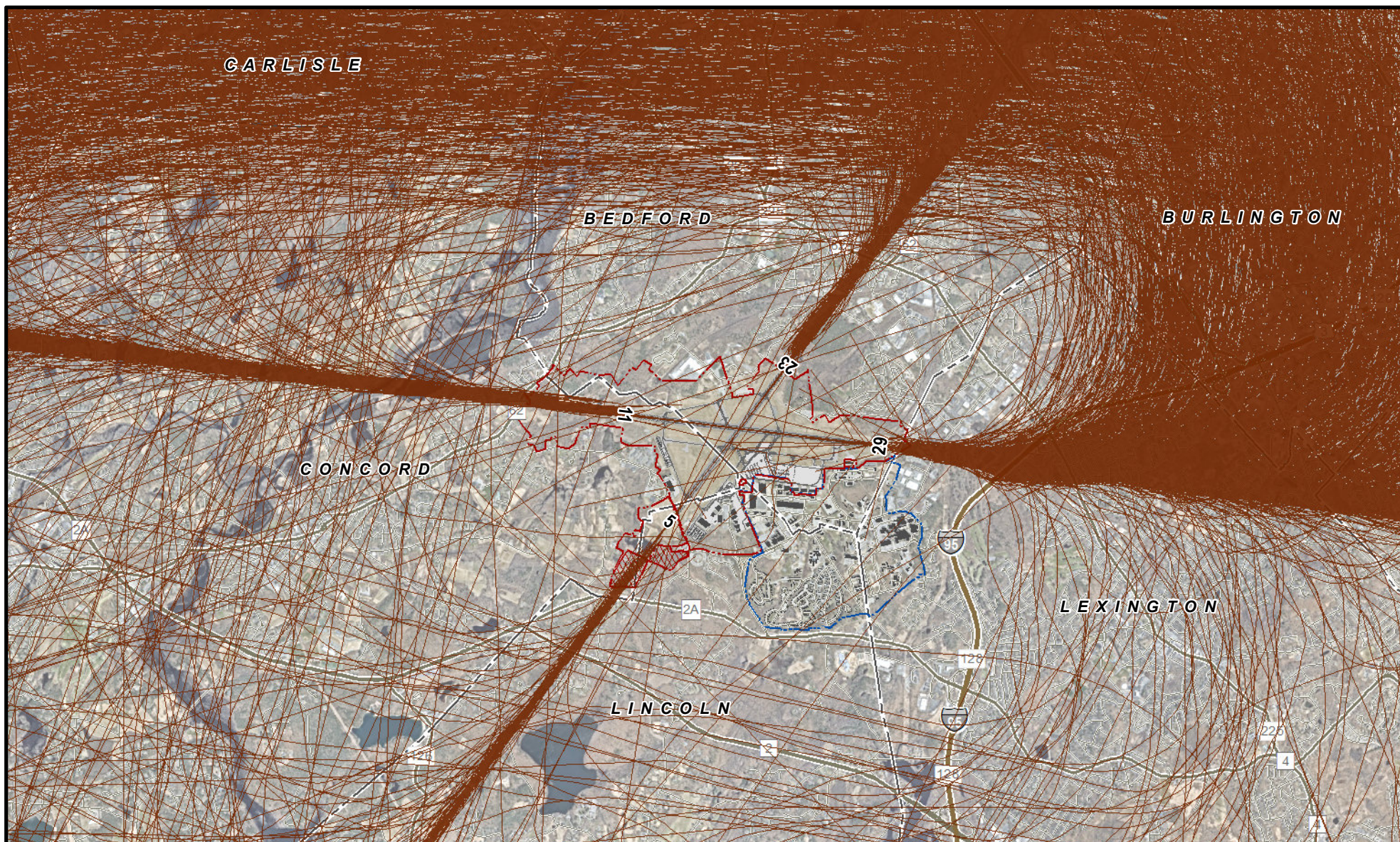
D.2.1 Flight Tracks

As described in Section 7.3.1, RealContours for AEDT was used to prepare the modeling input for AEDT. This allowed the direct use of over 50,000 individual radar tracks in the modeling. Each track was assigned the appropriate AEDT aircraft based on the identifying information in the radar data. Additionally, departures tracks were assigned the proper stagelength, a surrogate for aircraft takeoff weight, based on filed destination in the radar data. The runway for each operation was assigned automatically based on the proximity of the end of flight path to the runway ends and then further checked and refined by detailed visual review. Once fully reviewed for quality control, the individual flight track were imported to AEDT for modeling.

Figure 7-4 through Figure 7-8 display density plots for all of the flight tracks used in the modeling. The following figures display samples of the flight tracks used in the modeling. For clarity, approximately 20% of the tracks used in the modeling are displayed.

⁷ FICAN 1997. Federal Interagency Committee on Aviation Noise (FICAN) Effects of Aviation Noise on Awakenings from Sleep, June 1997.

Figure D-6 and Figure D-7 present a sample of the arrival and departure tracks for jet aircraft. Figure D-8 and Figure D-9 present representative tracks for arrivals and departures by propeller aircraft, including helicopters. Figure D-10 presents representative radar tracks for local piston aircraft operations.



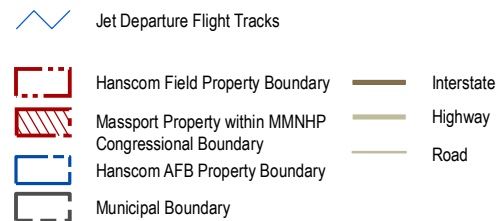
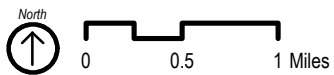
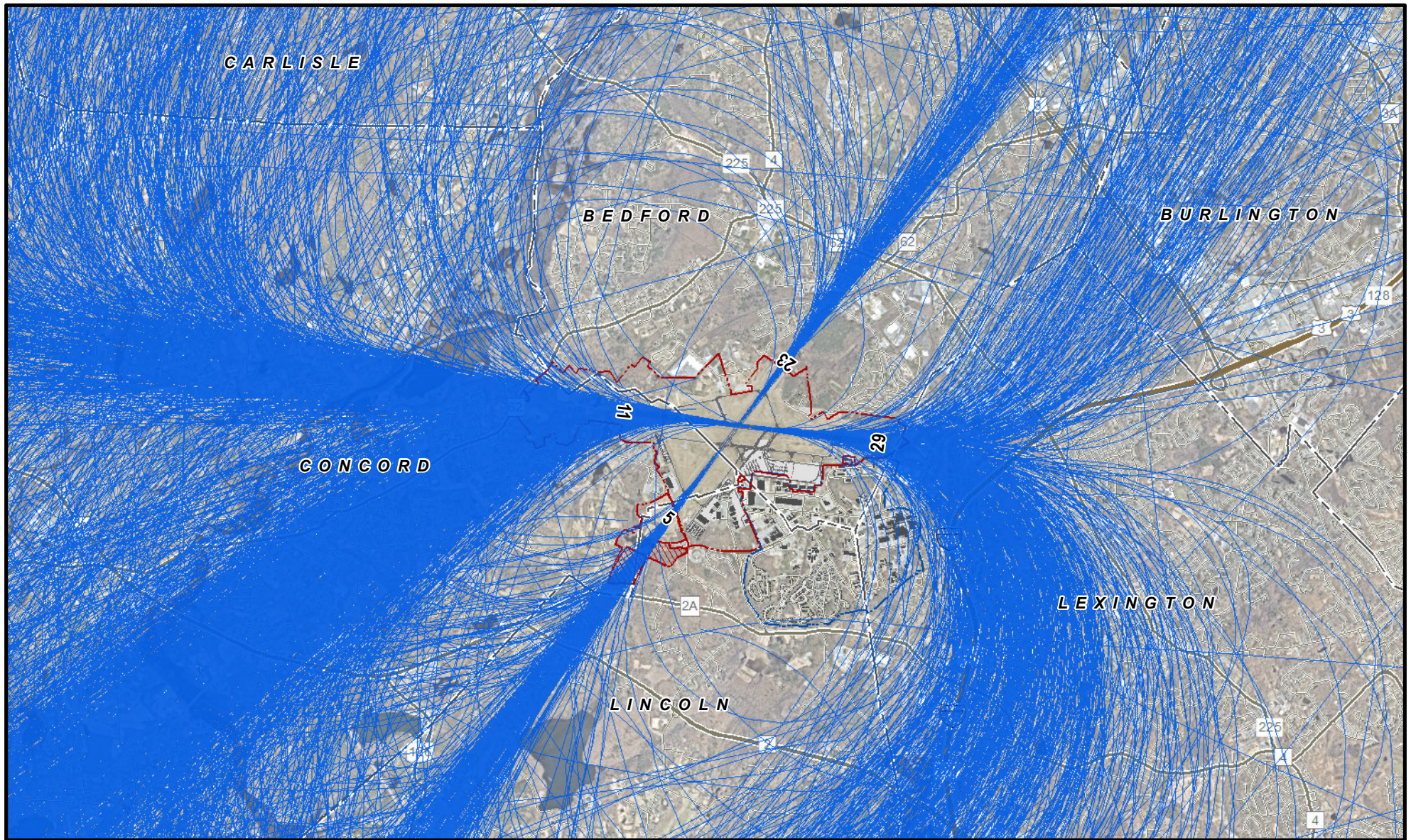
L. G. Hanscom Field

2017 Environmental Status & Planning Report

Representative Jet Arrival Flight Tracks

Data Sources: Massport Noise and Operations Monitoring System (flight tracks)
March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community
Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and
Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure D-6



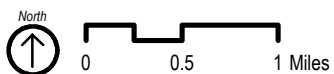
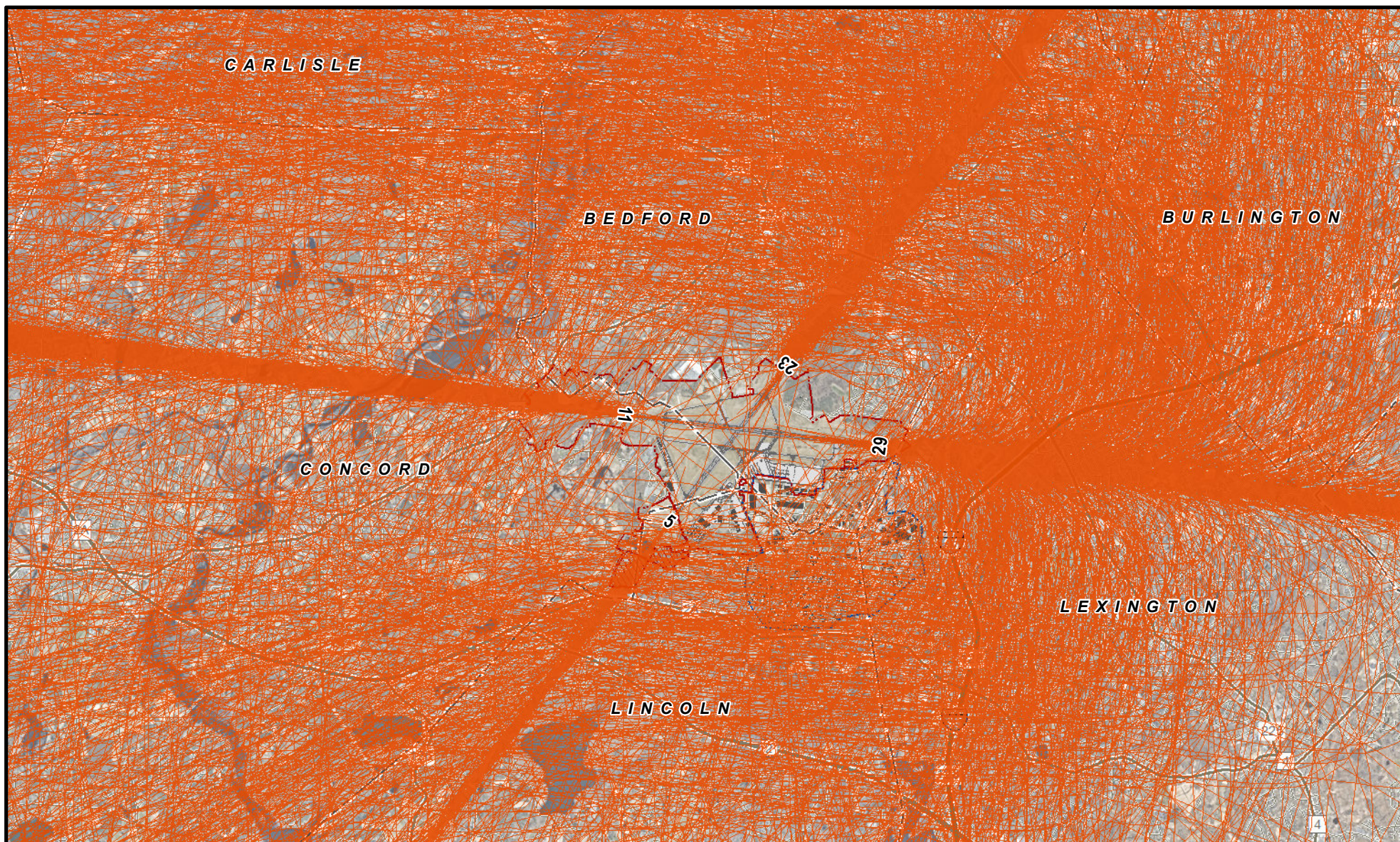
L. G. Hanscom Field









2017 Environmental Status & Planning Report

Representative Jet Departure Flight Tracks

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure D-7



- | | | | |
|---|---------------------------------|--|------------|
|  | Propeller Arrival Flight Tracks |  | Interstate |
|  | Hanscom Field Property Boundary |  | Highway |
|  | Massport Property within MMNHP |  | Road |
|  | Congressional Boundary | | |
|  | Hanscom AFB Property Boundary | | |
|  | Municipal Boundary | | |



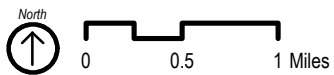
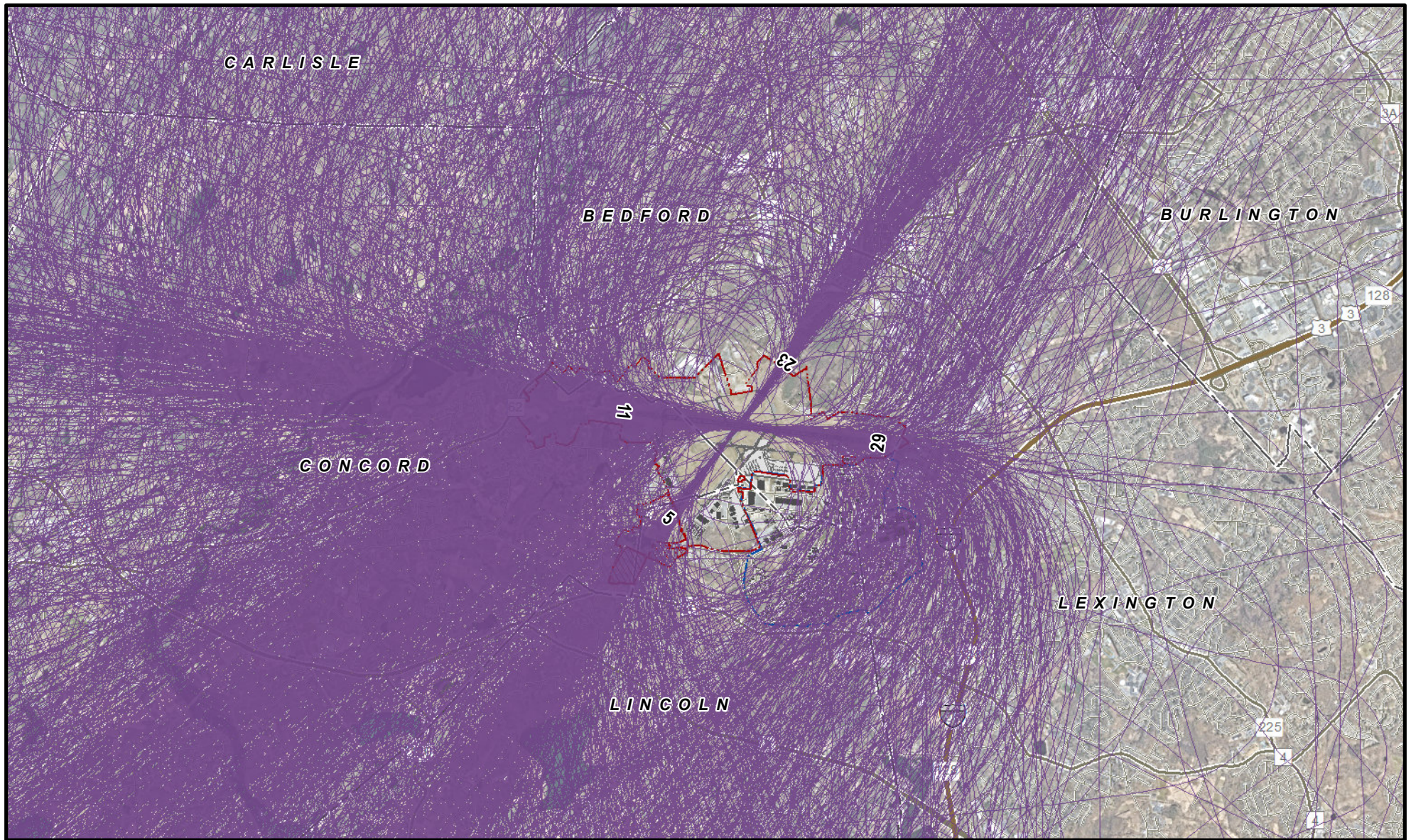
L. G. Hanscom Field










2017 Environmental Status & Planning Report

Representative Propeller Arrival Flight Tracks

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure D-8



-  Propeller Departure Flight Tracks
-  Hanscom Field Property Boundary
-  Massport Property within MMNHP
-  Congressional Boundary
-  Hanscom AFB Property Boundary
-  Municipal Boundary
-  Interstate
-  Highway
-  Road



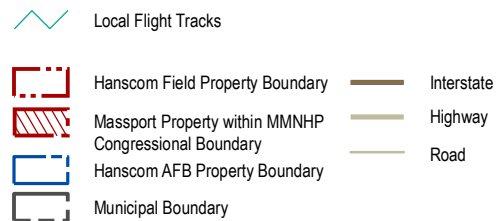
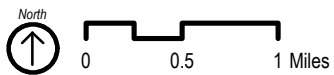
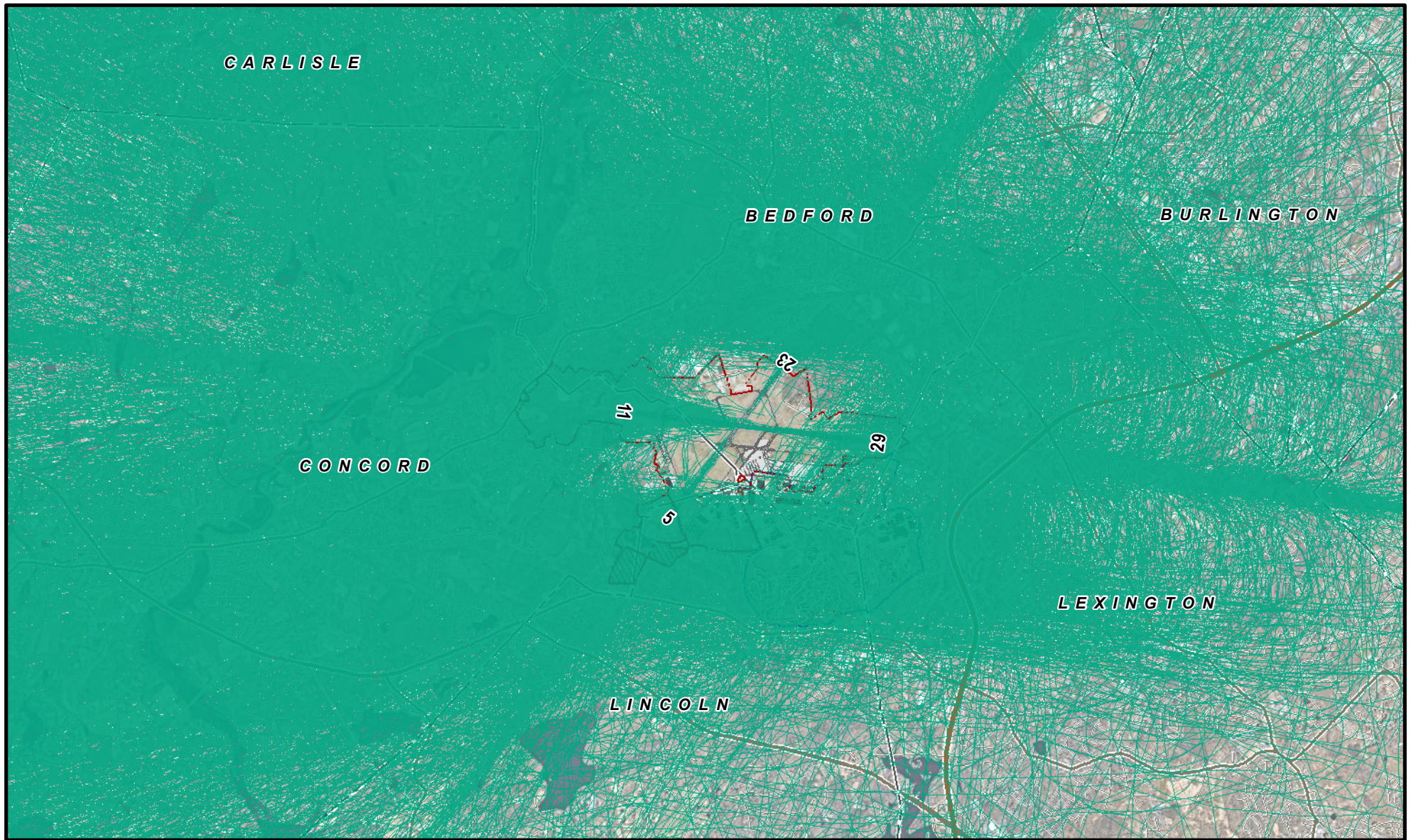
L. G. Hanscom Field

2017 Environmental Status & Planning Report

Representative Propeller Departure Flight Tracks

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure D-9



L. G. Hanscom Field

2017 Environmental Status & Planning Report

Representative Local Flight Tracks

Data Sources: Massport Noise and Operations Monitoring System (flight tracks) March 1, 2018; MassGIS (Roads, Rail), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; NPS (Park Boundary), July 30, 2018; NPS (Streets and Trails), July 30, 2018; MassGIS (Building Footprints), July 30, 2018

Figure D-10

D.2.2 Detailed Operations Tables

Table D-1 through Table D-3 present the average daily operations for 2017 and the two future scenarios. The operations are organized by AEDT noise aircraft type.

Table D-1 Year 2017 Average Daily Operations

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Jet	707	0.03	0.00	0.03	0.00	0.06
	737400	0.18	0.04	0.11	0.11	0.43
	737700	0.08	0.01	0.08	0.01	0.19
	737800	0.01	0.00	0.01	0.00	0.03
	767400	0.01	0.00	0.01	0.00	0.01
	757PW	0.13	0.05	0.09	0.09	0.37
	767CF6	0.00	0.00	0.00	0.00	0.01
	A319-131	0.01	0.00	0.01	0.00	0.03
	A320-211	0.00	0.00	0.00	0.00	0.01
	A321-232	0.00	0.00	0.00	0.00	0.01
	B57E	0.00	0.00	0.00	0.00	0.01
	BD-700-1A10	1.33	0.08	1.22	0.20	2.82
	BD-700-1A11	0.10	0.01	0.10	0.01	0.23
	CIT3	0.17	0.01	0.17	0.01	0.36
	CL600	5.80	0.38	5.54	0.63	12.35
	CL601	1.92	0.15	1.83	0.24	4.15
	CNA500	0.51	0.07	0.53	0.06	1.17
	CNA510	0.35	0.01	0.36	0.01	0.73
	CNA525C	1.10	0.09	1.05	0.15	2.39
	CNA55B	2.09	0.12	2.12	0.09	4.41
	CNA560E	0.50	0.01	0.48	0.02	1.01
	CNA560U	1.85	0.06	1.83	0.08	3.83
	CNA560XL	2.23	0.08	2.18	0.13	4.63
	CNA680	1.57	0.05	1.54	0.08	3.23
	CNA750	5.28	0.30	5.24	0.35	11.17
	CRJ9-ER	0.01	0.00	0.01	0.00	0.02
	ECLIPSE500	0.29	0.02	0.28	0.03	0.62

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Jet (continued)	EMB145	0.19	0.01	0.18	0.02	0.40
	EMB14L	0.03	0.01	0.04	0.00	0.08
	F-18	0.04	0.00	0.03	0.01	0.08
	FAL20	0.24	0.01	0.22	0.03	0.49
	GIIB	0.10	0.00	0.10	0.00	0.21
	GIV	4.06	0.18	3.88	0.35	8.47
	GV	1.80	0.17	1.78	0.19	3.94
	IA1125	0.65	0.04	0.66	0.03	1.38
	LEAR25	0.00	0.00	0.00	0.00	0.01
	LEAR35	6.63	0.32	6.46	0.48	13.89
	MD81	0.01	0.01	0.01	0.01	0.04
	MD82	0.01	0.00	0.01	0.00	0.01
	MD83	0.02	0.00	0.02	0.00	0.05
	MU3001	1.44	0.07	1.45	0.07	3.02
	T-38A	0.01	0.00	0.01	0.00	0.01
	Subtotal Jet Operations	40.81	2.36	39.68	3.50	86.36
Turboprop	1900D	0.70	0.00	0.69	0.01	1.40
	C130AD	0.08	0.00	0.08	0.00	0.17
	CNA208	4.94	0.16	4.90	0.20	10.20
	CNA441	0.29	0.01	0.29	0.01	0.60
	DHC6	4.43	0.11	4.34	0.20	9.08
	DO328	0.01	0.00	0.01	0.00	0.01
	EMB120	0.00	0.00	0.00	0.00	0.01
	PA42	0.03	0.00	0.03	0.00	0.05
Subtotal Turboprop Operations		10.48	0.27	10.35	0.41	21.52
Piston	BEC58P	4.12	0.07	4.07	0.13	8.39
	CNA172	7.09	0.01	7.08	0.03	14.20
	CNA182	3.59	0.00	3.58	0.00	7.18
	CNA206	0.95	0.00	0.95	0.00	1.90
	CNA20T	0.24	0.00	0.24	0.00	0.48
	COMSEP	14.14	0.03	14.13	0.04	28.34
	GASEPF	51.69	0.05	51.69	0.05	103.48
	GASEPV	24.70	0.03	24.70	0.03	49.45

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
	PA28	6.38	0.00	6.36	0.02	12.76
Subtotal Piston Operations		112.89	0.20	112.79	0.29	226.17
Helicopter	A109	0.39	0.00	0.38	0.01	0.79
	B206L	0.11	0.00	0.11	0.00	0.22
	B429	1.80	0.07	1.77	0.11	3.74
	H500D	0.41	0.00	0.41	0.00	0.81
	R44	1.51	0.00	1.51	0.00	3.02
	S70	0.08	0.00	0.08	0.00	0.16
	S76	5.51	0.15	5.28	0.38	11.31
	SA330J	1.85	0.05	1.89	0.01	3.81
	SA350D	0.05	0.00	0.05	0.00	0.11
Subtotal Helicopter Operations		11.71	0.28	11.48	0.51	23.98
Total Operations		175.90	3.12	174.29	4.72	358.02
Source: Hanscom EXP System, Massport NOMS, HMMH 2018						
Notes: 1.AEDT = Aviation Environmental Design Tool						

Table D-2 2025 Forecast Average Daily Operations

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Jet	707	0.03	0.00	0.03	0.00	0.06
	737400	0.21	0.05	0.13	0.13	0.53
	737700	0.10	0.01	0.10	0.02	0.23
	737800	0.01	0.00	0.01	0.00	0.03
	767400	0.01	0.00	0.01	0.00	0.02
	757PW	0.16	0.06	0.11	0.11	0.44
	767CF6	0.00	0.00	0.00	0.00	0.01
	A319-131	0.01	0.00	0.02	0.00	0.03
	A320-211	0.00	0.00	0.00	0.00	0.01
	A321-232	0.00	0.00	0.00	0.00	0.01
	B57E	0.00	0.00	0.00	0.00	0.01
	BD-700-1A10	1.63	0.10	1.49	0.24	3.45
	BD-700-1A11	0.13	0.01	0.13	0.01	0.28

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Jet (Continued)	CIT3	0.21	0.01	0.21	0.01	0.44
	CL600	7.09	0.46	6.78	0.77	15.09
	CL601	2.35	0.19	2.24	0.30	5.07
	CNA500	0.63	0.09	0.64	0.07	1.43
	CNA510	0.43	0.01	0.44	0.01	0.89
	CNA525C	1.35	0.11	1.28	0.18	2.92
	CNA55B	2.55	0.15	2.59	0.11	5.39
	CNA560E	0.61	0.01	0.59	0.03	1.24
	CNA560U	2.27	0.07	2.24	0.10	4.68
	CNA560XL	2.73	0.10	2.67	0.16	5.66
	CNA680	1.92	0.06	1.88	0.09	3.95
	CNA750	6.46	0.36	6.41	0.42	13.66
	CRJ9-ER	0.01	0.00	0.01	0.00	0.03
	ECLIPSE500	0.36	0.03	0.34	0.04	0.76
	EMB145	0.23	0.01	0.22	0.03	0.49
	EMB14L	0.04	0.01	0.04	0.01	0.10
	F-18	0.04	0.00	0.04	0.00	0.07
	FAL20	0.28	0.01	0.25	0.04	0.57
	GIIB	0.12	0.00	0.12	0.00	0.24
	GIV	4.96	0.21	4.75	0.43	10.35
	GV	2.19	0.21	2.17	0.23	4.81
	IA1125	0.79	0.05	0.81	0.03	1.68
	LEAR25	0.00	0.00	0.00	0.00	0.01
	LEAR35	8.10	0.39	7.90	0.58	16.96
	MD81	0.02	0.01	0.02	0.01	0.05
	MD82	0.01	0.00	0.01	0.00	0.02
	MD83	0.02	0.01	0.03	0.00	0.06
	MU3001	1.77	0.08	1.77	0.08	3.70
	T-38A	0.01	0.00	0.01	0.00	0.01
Subtotal Jet Operations		49.85	2.86	48.47	4.23	105.42
Turboprop	1900D	0.91	0.00	0.90	0.01	1.83
	C130AD	0.09	0.00	0.09	0.00	0.18

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Turboprop (Continued)	CNA208	6.42	0.20	6.38	0.24	13.23
	CNA441	0.38	0.01	0.38	0.01	0.77
	DHC6	5.70	0.14	5.60	0.24	11.68
	DO328	0.01	0.00	0.01	0.00	0.02
	EMB120	1.40	0.00	1.40	0.00	2.80
	PA42	0.04	0.00	0.04	0.00	0.07
	Subtotal Turboprop Operations	14.94	0.35	14.79	0.50	30.58
Piston	BEC58P	3.98	0.08	3.92	0.14	8.12
	CNA172	6.27	0.02	6.26	0.03	12.58
	CNA182	3.17	0.00	3.17	0.01	6.35
	CNA206	0.84	0.00	0.84	0.00	1.68
	CNA20T	0.21	0.00	0.21	0.00	0.42
	COMSEP	12.50	0.05	12.50	0.05	25.10
	GASEPF	45.87	0.06	45.86	0.06	91.85
	GASEPV	23.36	0.05	23.37	0.04	46.82
	PA28	5.64	0.01	5.62	0.03	11.30
	Subtotal Piston Operations	101.85	0.26	101.74	0.37	204.23
Helicopter	A109	0.45	0.01	0.44	0.02	0.92
	B206L	0.12	0.00	0.12	0.00	0.25
	B429	2.07	0.10	2.03	0.15	4.35
	H500D	0.47	0.00	0.47	0.00	0.94
	R44	1.73	0.01	1.73	0.00	3.47
	S70	0.09	0.00	0.09	0.00	0.19
	S76	6.35	0.22	6.03	0.54	13.14
	SA330J	2.12	0.07	2.17	0.02	4.39
	SA350D	0.06	0.00	0.06	0.00	0.12
	Subtotal Helicopter Operations	13.47	0.41	13.15	0.73	27.76
Total Operations		180.11	3.88	178.16	5.83	367.98
Source: Hanscom EXP System, Massport NOMS, HMMH, Intervistas 2018						
Notes: 1.AEDT = Aviation Environmental Design Tool						

Table D-3 2035 Forecast Average Daily Operations

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Jet	707	0.03	0.00	0.03	0.00	0.06
	737400	0.25	0.06	0.15	0.15	0.60
	737700	0.12	0.02	0.11	0.02	0.26
	737800	0.02	0.00	0.02	0.00	0.04
	767400	0.01	0.00	0.01	0.00	0.02
	757PW	0.18	0.07	0.12	0.13	0.50
	767CF6	0.00	0.00	0.00	0.00	0.01
	A319-131	0.02	0.00	0.02	0.00	0.04
	A320-211	0.00	0.00	0.00	0.00	0.01
	A321-232	0.00	0.00	0.00	0.00	0.01
	B57E	0.00	0.00	0.00	0.00	0.01
	BD-700-1A10	1.87	0.11	1.71	0.27	3.96
	BD-700-1A11	0.15	0.01	0.15	0.01	0.32
	CIT3	0.24	0.01	0.24	0.01	0.51
	CL600	8.14	0.53	7.78	0.88	17.32
	CL601	2.70	0.21	2.57	0.34	5.82
	CNA500	0.72	0.10	0.74	0.08	1.64
	CNA510	0.50	0.02	0.50	0.01	1.02
	CNA525C	1.55	0.13	1.47	0.20	3.35
	CNA55B	2.93	0.17	2.97	0.12	6.19
	CNA560E	0.70	0.02	0.68	0.03	1.42
	CNA560U	2.60	0.08	2.57	0.12	5.37
	CNA560XL	3.13	0.11	3.06	0.18	6.49
	CNA680	2.20	0.06	2.16	0.11	4.53
	CNA750	7.42	0.42	7.36	0.48	15.68
	CRJ9-ER	0.02	0.00	0.02	0.00	0.03
	ECLIPSE500	0.41	0.03	0.39	0.05	0.88
	EMB145	0.26	0.02	0.25	0.03	0.56
	EMB14L	0.05	0.01	0.05	0.01	0.11
	F-18	0.04	0.00	0.04	0.00	0.07
	FAL20	0.31	0.01	0.28	0.04	0.64

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Jet (Continued)	GIIB	0.13	0.00	0.13	0.00	0.26
	GIV	5.70	0.24	5.45	0.49	11.88
	GV	2.51	0.24	2.49	0.26	5.51
	IA1125	0.91	0.06	0.93	0.04	1.93
	LEAR25	0.00	0.00	0.00	0.00	0.01
	LEAR35	9.29	0.44	9.06	0.67	19.46
	MD81	0.02	0.01	0.02	0.01	0.06
	MD82	0.01	0.00	0.01	0.00	0.02
	MD83	0.03	0.01	0.03	0.00	0.07
	MU3001	2.03	0.09	2.03	0.09	4.24
	T-38A	0.01	0.00	0.01	0.00	0.01
Subtotal Jet Operations		57.17	3.29	55.60	4.86	120.91
Turboprop	1900D	1.09	0.00	1.08	0.01	2.19
	C130AD	0.10	0.00	0.10	0.00	0.19
	CNA208	7.69	0.23	7.63	0.28	15.83
	CNA441	0.45	0.01	0.45	0.01	0.92
	DHC6	6.79	0.17	6.68	0.28	13.91
	DO328	0.01	0.00	0.01	0.00	0.02
	EMB120	2.45	0.35	2.45	0.35	5.59
	PA42	0.04	0.00	0.04	0.00	0.08
Subtotal Turboprop Operations		18.62	0.75	18.44	0.93	38.74
Piston	BEC58P	3.94	0.09	3.88	0.15	8.07
	CNA172	6.07	0.02	6.05	0.03	12.17
	CNA182	3.07	0.00	3.07	0.01	6.15
	CNA206	0.81	0.00	0.81	0.00	1.62
	CNA20T	0.21	0.00	0.21	0.00	0.41
	COMSEP	12.10	0.05	12.09	0.05	24.29
	GASEPF	44.78	0.06	44.77	0.06	89.68
	GASEPV	22.71	0.05	22.71	0.04	45.51
	PA28	5.46	0.01	5.44	0.02	10.93
Subtotal Piston Operations		99.14	0.27	99.03	0.38	198.82
Helicopter	A109	0.49	0.01	0.47	0.02	0.99

Aircraft Category	AEDT ¹ TYPE	Departures		Arrivals		Total
		Day	Night	Day	Night	
Helicopter (Continued)	B206L	0.14	0.00	0.14	0.00	0.27
	B429	2.24	0.11	2.19	0.16	4.71
	H500D	0.51	0.00	0.51	0.00	1.01
	R44	1.87	0.01	1.88	0.00	3.75
	S70	0.10	0.00	0.10	0.00	0.20
	S76	6.88	0.24	6.53	0.59	14.23
	SA330J	2.30	0.08	2.35	0.02	4.75
	SA350D	0.07	0.00	0.07	0.00	0.14
Subtotal Helicopter Operations		14.59	0.44	14.23	0.80	30.06
Total Operations		189.52	4.75	187.30	6.96	388.53

Source: Hanscom EXP System, Massport NOMS, HMMH, Intervistas 2018
Notes: 1.AEDT = Aviation Environmental Design Tool

D.2.3 Analysis of Land Use & Population within DNL Contours

In order to estimate the number of people residing within the noise contours, existing land use maps developed by parcel boundary were obtained from MassGIS and overlaid on 2010 US Census TIGER file maps that depict the smallest enumeration unit; Census block data. Polygons were then created using land use that concentrated populated areas into the residential portion of the census block where people actually live – for example, in some areas, the population is concentrated along the road, rather than over several square miles of open or undeveloped land.

Using Geographic Information Systems (GIS) tools, the noise contours were intersected with these “Residential/Census” data for each DNL noise contour interval. The resultant wholly or partially encompassed Residential/Census areas were then identified; the proportion of total area within the contour level was then computed to determine the estimated residential population counts and ascribed to that level. Figure D-11 and Figure D-12 show the land use and census data and the process used for the analysis.



North
↑

0 2,000 4,000 Feet

Data Sources: MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; MassGIS (Land Use), Aug 29, 2013;

	Hanscom Field Property Boundary		Interstate		Residential		Open Land		Mining
	Massport Property within MNHP Congressional Boundary		Highway		Multi-Family Residential		Golf Course/Recreation		Open Water
	Hanscom AFB Property Boundary		Road		Public / Institutional		Forested/Brushland		Transportation
	Municipal Boundary		Trail		Commercial		Forested Wetland		
			Stream		Industrial		Non-Forested Wetland		
					Cemetery		Powerline / Utility		
					Agricultural / Pasture		Junkyard / Waste Disposal		

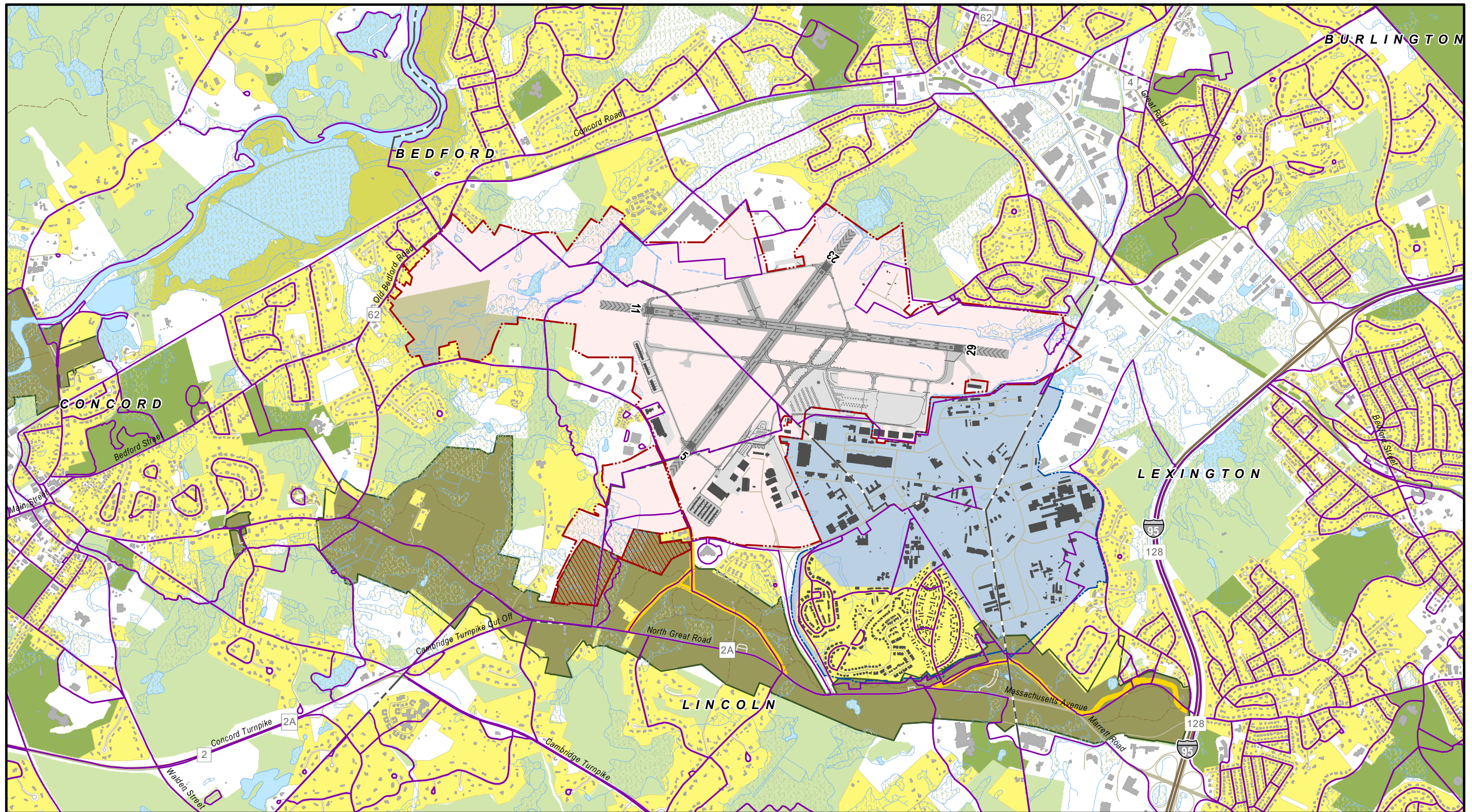
L. G. Hanscom Field

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Existing Land Use

Figure D-11

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Data Sources: MassGIS (Roads, Rail), July 30, 2018; MassGIS (Bike Trails, Tracks and Trails), July 30, 2018; MassGIS (Community Boundaries), July 30, 2018; MassGIS (DEP Wetlands), July 30, 2018; MassGIS (Building Footprints), July 30, 2018; MassGIS (Land Use), Aug 29, 2013;

- | | | | |
|---|---------------|------------------------------------|--------|
| 2010 US Census Block Boundary | Historic Road | Open Water | Stream |
| Populated Census/Residential Land Use | Interstate | Wetland/Marsh | |
| Hanscom Field Property Boundary | Highway | | |
| Massport Property within MMNHP Congressional Boundary | Road | MMNHP Boundary | |
| Hanscom AFB Property Boundary | Trail | Great Meadows | |
| Municipal Boundary | | Open Space Non-protected | |
| | | Open Space Protected in Perpetuity | |



L. G. Hanscom Field

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2010 Census Blocks and Residential Land Use

Figure D-12

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D.3 Detailed Noise Modeling Results

The following sections present the detailed noise modeling results at noise analysis locations in the four towns, detailed noise modeling results at locations in Minute Man National Historical Park (MMNHP), and the results of calculation of Total Noise Exposure (EXP).

D.3.1 Noise Modeling Results at Noise Analysis Locations

Table D-4 and Table D-5 present the calculated Time Above 65 dBA in 2005, 2012, 2017 and the 2025 and 2035 scenarios at noise analysis locations in each town: Bedford, Concord, Lexington, and Lincoln. Tables D-8 through D-11 present the Time Above 55 dBA (TA55) values, respectively, for the noise analysis locations in 2005, 2012, 2017 and the 2025 and 2035 scenarios.

Table D-4 Time Above 65 dB at Noise Sensitive Receptors in Bedford (minutes)

Label ¹	Name ²	Address (Bedford)	2012	2017	2025	2035
HB-1	Veterans Administration Medical Center*	200 Springs Rd	0.5	1.0	1.1	1.2
NB-1	Bedford Historic District	Great Rd.	1.0	1.6	1.6	1.7
NB-2	Old Bedford Center Historic District	Great Rd.	1.4	2.1	2.1	2.3
NB-3	Old Burying Ground	7 Springs Rd.	1.6	2.3	2.3	2.5
NB-4	Old Town Hall	16 South Rd.	1.8	2.5	2.5	2.7
NB-5	Bedford Depot Park Historic District	80 Loomis St./120 South Rd.	4.7	6.6	5.9	6.4
NB-6	Nathaniel Page House	89 Page Rd.	2.3	3.9	3.7	4.0
NB-7	Christopher Page House	50 Old Billerica Rd.	1.6	3.0	2.9	3.2
NB-8	Bacon-Gleason-Blodgett Homestead	118 Wilson Rd.	0.7	1.2	1.3	1.5
NB-9	Historic Wilson Mill-Old Burlington Road Historic Dist.	Old Burlington and Wilson Rds.	0.6	1.1	1.3	1.4
NB-10	Shawsheen Cemetery **	Shawsheen Rd.	1.2	2.0	2.1	2.2
NB-11	David Lane House	137 North Rd.	0.5	0.9	0.9	0.9
OB-1	Old Billerica Road Area ** (NR nomination form in process)	Old Billerica Rd	1.7	3.5	3.3	3.6
PB-1	Town Hall *	10 Mudge Way	1.4	2.1	2.2	2.3
PB-2	Library **	7 Mudge Way	1.1	1.8	1.8	1.9
PB-3	Bedford School District	11Mudge Way	1.4	2.1	2.2	2.3

Label ¹	Name ²	Address (Bedford)	2012	2017	2025	2035
PB-4	Department of Public Works	314 Great Rd.	1.5	2.1	2.3	2.4
RB-1	The Lutheran Church of the Savior	426 Davis Rd.	3.6	4.7	5.7	6.2
RB-2	First Baptist Church of Bedford	155 Concord Rd.	0.9	1.6	1.6	1.6
RB-3	St. Michael's Church	90 Concord Rd.	0.9	1.4	1.4	1.4
RB-4	Boston Buddha Vararam Temple	125 North Rd.	0.5	0.9	0.9	0.9
RB-5	The First Church of Christ Congregational/ United Church of Christ *	25 Great Rd.	1.2	1.9	1.9	2.0
RB-6	The First Parish in Bedford Unitarian Universalist *	75 Great Rd.	1.7	2.4	2.4	2.6
RB-7	St. Paul's Episcopal Church	100 Pine Hill Rd.	0.5	1.0	0.9	1.0
RB-8	March for Jesus	54 Summer St.	14.2	9.3	10.0	10.7
RB-9	Immanuel Baptist Church	400 Great Rd.	1.4	2.2	2.3	2.4
SB-1	Davis School	Davis Rd.	0.5	1.2	1.1	1.1
SB-2	Bedford High School **	9 Mudge Way	1.1	1.7	1.8	1.8
SB-3	John Glenn Middle School	99 McMahon Rd.	1.5	2.3	2.3	2.4

Notes:

1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR.

2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Old Bedford Center Historic District.

Source: HMMH

Table D-5 Time Above 65 dB at Noise Sensitive Receptors in Concord (minutes)

Label ¹	Name ²	Address (Concord)	2012	2017	2025	2035
NC-1	Barrett Farm Historic District†	Barrett's Mill Rd.	0.7	1.5	1.8	2.0
NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd.	2.7	3.6	4.4	5.0
NC-3	Joseph Hosmer House	572 Main St.	0.9	1.7	2.0	2.2
NC-4	Thoreau-Alcott House	255 Main St.	2.1	3.0	3.7	4.1
NC-5	Hubbardville Historic District†	324-374 Sudbury Rd.	2.9	3.7	4.7	5.2

Label ¹	Name ²	Address (Concord)	2012	2017	2025	2035
NC-6	Hubbard-French Historic District	324-374 Sudbury Rd.	2.9	3.7	4.7	5.2
NC-7	Deacon Thomas Hubbard/ Judge Henry French House	342 Sudbury Rd.	2.8	3.6	4.6	5.1
NC-8	Pest House	158 Fairhaven Rd.	2.7	3.4	4.2	4.7
NC-9	Main Street Historic District†	Main St. between Monument Sq. and Wood St.	3.7	4.3	5.4	6.0
NC-10	North Bridge-Monument Square Historic District†	Monument St., Liberty St. and Lowell St.	3.3	4.0	5.1	5.7
NC-11	Wright Tavern	Lexington Rd. & Main St.	3.8	4.4	5.6	6.2
NC-12	Sleepy Hollow Cemetery	24 Court Ln.	4.3	5.0	6.3	7.1
NC-13	American Mile Historic District†	Lexington Rd.	4.1	4.8	6.0	6.7
NC-14	Concord Monument Square- Lexington Road Historic District	Monument Sq. and Lexington Rd.	3.7	4.3	5.4	6.1
NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike	4.7	5.4	6.8	7.5
NC-16	Walden Pond ⁴	MA Rte 126 (Main Beach)	1.0	2.5	2.3	2.5
NC-17	Orchard House	399 Lexington Rd.	5.6	6.2	7.7	8.5
NC-18	Deacon John Wheeler/ Capt. Jonas Minot Farmhouse	341 Virginia Rd.	36.0	26.4	30.6	33.2
NC-19	Wheeler-Meriam House	477 Virginia Rd.	36.1	27.6	31.3	33.9
NC-20	Concord Armory-Concord Veteran's Building	51 Walden St.	3.8	4.4	5.6	6.3
NC-21	Concord School of Philosophy	391 Lexington Rd.	5.7	6.3	7.8	8.7
NC-22	Hosmer Homestead	138 Baker Ave.	0.3	0.7	0.8	0.8
PC-1	Library **	129 Main St.	3.0	3.7	4.7	5.2
PC-2	Town Hall ††	22 Monument Sq.	3.6	4.2	5.3	6.0
PC-3	Middlesex County Court House	305 Walden St.	4.3	5.0	6.1	6.8
RC-1	Trinity Episcopal Church **	81 Elm St.	1.3	2.1	2.5	2.8
RC-2	Redeemer Presbyterian Church	191 Sudbury Rd.	2.9	3.7	4.6	5.2

Label ¹	Name ²	Address (Concord)	2012	2017	2025	2035
RC-3	New Life Community Church (meeting at the Emerson School Building **)	40 Stow St.	3.4	4.0	5.1	5.7
RC-4	Trinitarian Congregational Church **	54 Walden St.	3.8	4.4	5.6	6.2
RC-5	First Church of Christ Scientist ^{††}	7 Lowell Rd.	3.3	3.9	4.9	5.5
RC-6	St. Bernard's Parish ^{††}	70 Monument Square	3.5	4.1	5.2	5.8
RC-7	Christian Science Reading Room	20 Main St.	3.6	4.2	5.3	5.9
RC-8	First Parish in Concord ^{††}	20 Lexington Rd.	3.9	4.5	5.7	6.4
SC-1	Nashoba/Brooks School	200 Strawberry Hill Rd.	2.8	3.8	4.6	5.2
SC-2	Middlesex School**	1400 Lowell Rd.	0.3	0.7	0.7	0.8
SC-3	Fenn School **	498-516 Monument St.	6.1	7.6	9.4	10.5
SC-4	Concord Academy **	166 Main St.	2.4	3.2	4.1	4.5
SC-5	Alcott School	91 Laurel Rd.	4.1	4.8	6.0	6.6
SC-6	Concord/Carlisle High School	500 Walden Rd.	3.0	3.7	4.5	5.0
SC-7	Ripley School	120 Meriam Rd.	9.8	10.1	13.0	14.5

Notes:

1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR.

2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites marked with a (†) are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Concord Monument Square-Lexington Road Historic District.

Source: HMMH 2018.

Table D-6 Time Above 65 dB at Noise Sensitive Receptors in Lexington (minutes)

Label ¹	Name ²	Address (Lexington)	2012	2017	2025	2035
NLX-1	Simonds Tavern	331 Bedford St.	10.2	10.6	13.3	14.9
NLX-2	Hancock-Clarke Historic District [†]	Hancock St.	0.9	1.0	1.1	1.2
NLX-3	Hancock-Clarke House	35 Hancock St.	0.8	0.9	1.0	1.1
NLX-4	Garriety House	9 Hancock St.	0.9	1.0	1.1	1.2
NLX-5	Lexington Green Historic District	Mass. Ave., Harrington Rd. and Bedford St.	0.9	1.1	1.2	1.3
NLX-6	Lexington Green	Mass. Ave., Harrington Rd. and Bedford St.	0.9	1.0	1.1	1.3
NLX-7	Buckman Tavern	1 Bedford St.	0.9	1.0	1.1	1.2
NLX-8	General Samuel Chandler House	8 Goodwin Rd.	0.8	0.9	1.0	1.1
NLX-9	Hancock School	33 Forest St.	0.9	1.1	1.2	1.3
NLX-10	U.S. Post Office Building	1661 Mass. Ave.	0.5	0.6	0.7	0.8
NLX-11	Warren E. Shelburne House	11 Percy Rd.	0.3	0.4	0.4	0.5
NLX-12	Munroe Tavern Historic District [†]	Mass. Ave.	0.2	0.2	0.3	0.3
NLX-13	Sanderson House-Munroe Tavern	1314 & 1332 Mass. Ave.	0.2	0.3	0.3	0.4
NLX-14	John Mason House	1303 Mass. Ave.	0.2	0.3	0.4	0.4
NLX-15	East Village Historical District [†]	Mass Ave.	0.1	0.2	0.3	0.3
NLX-16	M.H. Merriam and Company	7-9 Oakland Ave.	0.7	0.8	0.9	0.9
OLX-1	Battle Green Historic District ^{**}	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave. and B&M Railroad	0.9	1.0	1.1	1.3
OLX-2	National Heritage Museum	33 Marrett Rd.	0.1	0.3	0.4	0.4
PLX-1	Library ^{**}	1874 Mass. Ave.	1.0	1.1	1.3	1.4
PLX-2	Town Hall ^{**}	1625 Mass. Ave.	0.3	0.4	0.5	0.5
PLX-3	Lexington School District Administration ^{**}	1557 Massachusetts Ave.	0.4	0.5	0.6	0.6

RLX-1	Lexington United Methodist Church/ St. John's Korean United Methodist Church ⁴	2600 Massachusetts Ave.	2.0	3.3	3.6	4.0
RLX-2	Temple Isaiah	55 Lincoln St.	1.5	2.1	2.3	2.5
RLX-3	Grace Chapel of Lexington	59 Worthen Rd.	1.5	1.7	1.9	2.1
RLX-4	St. Brigid's Parish *	2001 Mass. Ave.	1.3	1.5	1.6	1.8
RLX-5	First Parish-Unitarian Church ^{††}	7 Harrington Rd.	1.0	1.2	1.3	1.4
RLX-6	Hancock United Church of Christ ^{††}	1912 Mass. Ave.	1.0	1.1	1.3	1.4
RLX-7	Church of Our Redeemer	6 Meriam St.	0.8	0.9	1.0	1.1
RLX-8	Christian Science Reading Room	10 Muzzy St. #12	0.7	0.8	0.9	1.0
RLX-9	Greek Orthodox Church of St. Nichols ^{**}	17 Meriam St.	0.7	0.8	0.9	1.0
RLX-10	Chabad Center ^{**}	9 Burlington St.	5.9	6.0	7.7	8.7
RLX-11	Pilgrim Congregational Church	55 Coolidge Ave.	1.1	1.4	1.8	2.0
RLX-12	First Baptist Church of Lexington ^{**}	1580 Mass. Ave.	0.4	0.5	0.6	0.6
RLX-13	Jehovah's Witnesses	196 Woburn St.	0.1	0.3	0.3	0.3
RLX-14	Follen Church Society-Unitarian Universalists *	755 Massachusetts Ave.	0.1	0.3	0.3	0.3
RLX-15	Countryside Bible Chapel	480 Lowell St.	0.1	0.4	0.5	0.5
RLX-16	St. Paul Evangelical Church	451 Lowell St.	0.1	0.4	0.4	0.4
SLX-1	Minuteman Regional Vocational High School	758 Marrett Rd.	1.0	1.8	2.0	2.1
SLX-2	Maria Hastings School	2618 Mass. Ave.	1.7	3.0	3.3	3.6
SLX-3	Methodist Weekday School	2600 Massachusetts Ave.	2.0	3.3	3.6	4.0
SLX-4	Community Nursery School	2325 Massachusetts Ave.	2.1	3.0	3.3	3.6
SLX-5	Bridge Elementary School ^{**}	55 Middleby Rd.	1.0	1.7	1.9	2.1
SLX-6	Lexington High School	251 Waltham St.	0.8	1.1	1.2	1.3
SLX-7	Jonas Clarke Middle School	17 Stedman Rd.	0.2	1.0	1.2	1.3

SLX-8	Estabrook School**	117 Grove St.	1.4	1.8	2.0	2.2
SLX-9	Diamond Middle School	99 Hancock St.	5.4	6.0	7.8	8.7
SLX-10	Fiske Elementary School	146 Maple St.	0.6	0.9	1.1	1.2
SLX-11	Armenian Sisters Academy	20 Pelham Rd.	0.2	0.4	0.4	0.5
SLX-12	Harrington Elementary School	148 Maple St.	0.0	0.2	0.2	0.2

Notes:

1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR.

2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Lexington Green Historic District.

3. The Lexington United Methodist Church and St. John's Korean United Methodist Church are at the same address.

Source: HMMH

Table D-7 Time Above 65 dB at Noise Sensitive Receptors in Lincoln (minutes)

Label ¹	Name ²	Address (Lincoln)	2012	2017	2025	2035
NLN-1	Walden Pond	Rte. 126, Walden St., Concord Rd.	0.7	2.5	2.3	2.5
NLN-2	Henry Higginson House	44 Baker Farm Rd.	0.9	2.9	2.4	2.6
NLN-3	Daniel Brooks House	Brooks Rd.	4.0	7.1	5.3	5.7
NLN-4	Lincoln Center Historic District	Bedford Rd. Lincoln Rd., Old Lexington Rd. Sandy Pond Rd. Trapelo Rd. Weston Rd.	0.5	1.1	1.1	1.2
NLN-5	Hoar Tavern	268 Cambridge Tpke.	0.7	1.4	1.5	1.7
SLN-1	Carroll School	25 Baker Bridge Rd.	0.5	1.7	1.5	1.6
SLN-2	Hanscom Middle School	Hanscom AFB	4.0	3.6	3.8	3.9
SLN-3	Hanscom Primary School	Hanscom AFB	3.9	3.6	3.8	3.8
<p>Notes:</p> <p>1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR.</p> <p>2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS.</p> <p>Source: HMMH 2018</p>						

Table D-8 Time Above 55 dB at Noise Sensitive Receptors in Bedford (minutes)

Label ¹	Name ²	Address (Bedford)	2012	2017	2025	2035
HB-1	Veterans Administration Medical Center*	200 Springs Rd	7.3	12.0	12.0	12.8
NB-1	Bedford Historic District	Great Rd.	17.0	21.6	20.6	21.0
NB-2	Old Bedford Center Historic District	Great Rd.	20.8	25.2	24.1	24.6
NB-3	Old Burying Ground	7 Springs Rd.	18.9	24.3	23.0	23.5
NB-4	Old Town Hall	16 South Rd.	22.2	27.4	25.8	26.4
NB-5	Bedford Depot Park Historic District	80 Loomis St./120 South Rd.	46.4	52.9	48.5	49.5
NB-6	Nathaniel Page House	89 Page Rd.	15.3	23.1	20.8	22.0
NB-7	Christopher Page House	50 Old Billerica Rd.	12.5	19.5	17.8	18.9
NB-8	Bacon-Gleason-Blodgett Homestead	118 Wilson Rd.	8.4	11.5	12.1	13.1
NB-9	Historic Wilson Mill-Old Burlington Road Historic Dist.	Old Burlington and Wilson Rds.	8.3	11.4	12.0	13.1
NB-10	Shawsheen Cemetery **	Shawsheen Rd.	27.0	28.2	28.8	29.8
NB-11	David Lane House	137 North Rd.	7.0	12.3	11.6	12.0
OB-1	Old Billerica Road Area ** (NR nomination form in process)	Old Billerica Rd	11.9	18.4	16.9	18.1
PB-1	Town Hall *	10 Mudge Way	24.8	27.7	26.6	27.0
PB-2	Library **	7 Mudge Way	24.0	26.0	25.1	25.4
PB-3	Bedford School District	11Mudge Way	26.6	28.9	27.8	28.2
PB-4	Department of Public Works	314 Great Rd.	27.6	30.0	30.1	31.3
RB-1	The Lutheran Church of the Savior	426 Davis Rd.	43.1	47.9	52.0	55.1
RB-2	First Baptist Church of Bedford	155 Concord Rd.	35.1	39.5	39.7	40.5
RB-3	St. Michael's Church	90 Concord Rd.	25.6	27.7	26.6	26.8
RB-4	Boston Buddha Vararam Temple	125 North Rd.	7.1	12.5	11.8	12.2
RB-5	The First Church of Christ Congregational/ United Church of Christ *	25 Great Rd.	21.5	24.9	24.0	24.3
RB-6	The First Parish in Bedford Unitarian Universalist *	75 Great Rd.	23.4	28.0	26.6	27.1

Label ¹	Name ²	Address (Bedford)	2012	2017	2025	2035
RB-7	St. Paul's Episcopal Church	100 Pine Hill Rd.	6.8	11.5	11.1	11.6
RB-8	March for Jesus	54 Summer St.	84.2	64.9	72.6	77.6
RB-9	Immanuel Baptist Church	400 Great Rd.	31.0	29.8	30.4	31.5
SB-1	Davis School	Davis Rd.	14.6	21.2	20.3	20.5
SB-2	Bedford High School **	9 Mudge Way	26.3	27.6	26.8	27.0
SB-3	John Glenn Middle School	99 McMahon Rd.	38.5	38.9	38.2	38.6

Notes:

1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR.

2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Old Bedford Center Historic District.

Source: HMMH

Table D-9 Time Above 55 dB at Noise Sensitive Receptors in Concord (minutes)

Label ¹	Name ²	Address (Concord)	2012	2017	2025	2035
NC-1	Barrett Farm Historic District†	Barrett's Mill Rd.	11.9	16.5	18.8	20.6
NC-2	Jonathan Hildreth House	8 Barrett's Mill Rd.	20.9	27.3	31.6	34.4
NC-3	Joseph Hosmer House	572 Main St.	14.2	22.4	24.7	26.4
NC-4	Thoreau-Alcott House	255 Main St.	19.6	27.8	31.1	33.4
NC-5	Hubbardville Historic District†	324-374 Sudbury Rd.	19.0	28.1	31.0	33.2
NC-6	Hubbard-French Historic District	324-374 Sudbury Rd.	19.0	28.0	30.9	33.1
NC-7	Deacon Thomas Hubbard/ Judge Henry French House	342 Sudbury Rd.	18.9	28.0	31.0	33.2
NC-8	Pest House	158 Fairhaven Rd.	18.7	27.8	30.4	32.5
NC-9	Main Street Historic District†	Main St. between Monument Sq. and Wood St.	24.8	32.8	37.0	39.9
NC-10	North Bridge-Monument Square Historic District†	Monument St., Liberty St. and Lowell St.	26.7	33.6	39.0	42.5
NC-11	Wright Tavern	Lexington Rd. & Main St.	24.9	33.1	37.3	40.2
NC-12	Sleepy Hollow Cemetery	24 Court Ln.	28.3	35.7	40.7	44.1
NC-13	American Mile Historic District†	Lexington Rd.	25.7	34.0	38.2	41.2

Label ¹	Name ²	Address (Concord)	2012	2017	2025	2035
NC-14	Concord Monument Square-Lexington Road Historic District	Monument Sq. and Lexington Rd.	24.9	32.9	37.2	40.1
NC-15	Ralph Waldo Emerson House	28 Cambridge Turnpike	26.7	35.7	39.7	42.7
NC-16	Walden Pond ⁴	MA Rte 126 (Main Beach)	13.5	22.2	21.3	22.6
NC-17	Orchard House	399 Lexington Rd.	32.4	40.8	45.0	48.5
NC-18	Deacon John Wheeler/ Capt. Jonas Minot Farmhouse	341 Virginia Rd.	162.1	115.7	123.2	130.3
NC-19	Wheeler-Meriam House	477 Virginia Rd.	170.0	121.7	128.4	135.8
NC-20	Concord Armory-Concord Veteran's Building	51 Walden St.	24.4	32.9	36.8	39.7
NC-21	Concord School of Philosophy	391 Lexington Rd.	32.7	40.9	45.2	48.7
NC-22	Hosmer Homestead	138 Baker Ave.	7.6	14.1	15.0	15.8
PC-1	Library **	129 Main St.	21.9	30.3	33.9	36.5
PC-2	Town Hall ++	22 Monument Sq.	25.2	33.0	37.4	40.4
PC-3	Middlesex County Court House	305 Walden St.	24.1	34.0	37.0	39.7
RC-1	Trinity Episcopal Church **	81 Elm St.	16.5	24.5	27.3	29.3
RC-2	Redeemer Presbyterian Church	191 Sudbury Rd.	20.1	28.8	32.0	34.4
RC-3	New Life Community Church (meeting at the Emerson School Building **)	40 Stow St.	22.2	30.8	34.4	37.0
RC-4	Trinitarian Congregational Church **	54 Walden St.	23.9	32.5	36.3	39.1
RC-5	First Church of Christ Scientist++	7 Lowell Rd.	24.3	32.2	36.4	39.3
RC-6	St. Bernard's Parish++	70 Monument Square	24.6	32.5	36.7	39.6
RC-7	Christian Science Reading Room	20 Main St.	24.4	32.6	36.7	39.6
RC-8	First Parish in Concord ++	20 Lexington Rd.	24.9	33.2	37.3	40.2
SC-1	Nashoba/Brooks School	200 Strawberry Hill Rd.	16.3	21.3	24.5	26.6
SC-2	Middlesex School**	1400 Lowell Rd.	6.6	11.7	12.4	13.0
SC-3	Fenn School **	498-516 Monument St.	32.5	38.0	44.6	48.5
SC-4	Concord Academy **	166 Main St.	20.9	29.1	32.6	35.1
SC-5	Alcott School	91 Laurel Rd.	22.9	32.6	35.7	38.3

Label ¹	Name ²	Address (Concord)	2012	2017	2025	2035
SC-6	Concord/Carlisle High School	500 Walden Rd.	20.2	30.0	32.2	34.4
SC-7	Ripley School	120 Meriam Rd.	55.6	54.6	60.9	66.0
<p>Notes:</p> <p>1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR.</p> <p>2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Concord Monument Square-Lexington Road Historic District.</p> <p>Source: HMMH</p>						

Table D-10 Time Above 55 dB at Noise Sensitive Receptors in Lexington (minutes)

Label ¹	Name ²	Address (Lexington)	2012	2017	2025	2035
NLX-1	Simonds Tavern	331 Bedford St.	43.9	42.8	49.1	52.9
NLX-2	Hancock-Clarke Historic District†	Hancock St.	9.4	8.4	9.1	9.8
NLX-3	Hancock-Clarke House	35 Hancock St.	9.1	8.3	9.1	9.8
NLX-4	Garrity House	9 Hancock St.	9.3	8.3	8.9	9.5
NLX-5	Lexington Green Historic District	Mass. Ave., Harrington Rd. and Bedford St.	9.6	8.6	9.3	9.9
NLX-6	Lexington Green	Mass. Ave., Harrington Rd. and Bedford St.	9.3	8.4	9.0	9.7
NLX-7	Buckman Tavern	1 Bedford St.	8.8	8.0	8.6	9.2
NLX-8	General Samuel Chandler House	8 Goodwin Rd.	8.9	8.0	8.6	9.2
NLX-9	Hancock School	33 Forest St.	8.9	8.3	9.0	9.6
NLX-10	U.S. Post Office Building	1661 Mass. Ave.	6.2	5.9	6.4	6.8
NLX-11	Warren E. Shelburne House	11 Percy Rd.	3.3	3.7	4.1	4.4
NLX-12	Munroe Tavern Historic District†	Mass. Ave.	2.0	2.7	3.0	3.2
NLX-13	Sanderson House-Munroe Tavern	1314 & 1332 Mass. Ave.	2.7	3.2	3.5	3.7
NLX-14	John Mason House	1303 Mass. Ave.	2.9	3.4	3.7	3.9
NLX-15	East Village Historical District†	Mass Ave.	1.3	2.4	2.7	3.0

Label ¹	Name ²	Address (Lexington)	2012	2017	2025	2035
NLX-16	M.H. Merriam and Company	7-9 Oakland Ave.	7.4	6.8	7.3	7.8
OLX-1	Battle Green Historic District**	Worthen Rd., Woburn St., Hastings Rd., Mass. Ave. and B&M Railroad	9.3	8.4	9.1	9.7
OLX-2	National Heritage Museum	33 Marrett Rd.	1.7	2.8	3.1	3.4
PLX-1	Library **	1874 Mass. Ave.	10.0	9.0	9.6	10.3
PLX-2	Town Hall **	1625 Mass. Ave.	4.3	4.4	4.8	5.1
PLX-3	Lexington School District Administration **	1557 Massachusetts Ave.	5.2	5.1	5.5	5.9
RLX-1	Lexington United Methodist Church/ St. John's Korean United Methodist Church ⁴	2600 Massachusetts Ave.	17.3	16.1	17.4	18.8
RLX-2	Temple Isaiah	55 Lincoln St.	11.6	11.6	12.5	13.5
RLX-3	Grace Chapel of Lexington	59 Worthen Rd.	13.7	11.6	12.4	13.3
RLX-4	St. Brigid's Parish *	2001 Mass. Ave.	12.0	10.5	11.3	12.1
RLX-5	First Parish-Unitarian Church ⁺⁺	7 Harrington Rd.	10.2	9.1	9.8	10.5
RLX-6	Hancock United Church of Christ ⁺⁺	1912 Mass. Ave.	9.7	8.8	9.4	10.1
RLX-7	Church of Our Redeemer	6 Meriam St.	8.6	7.8	8.4	8.9
RLX-8	Christian Science Reading Room	10 Muzzy St. #12	7.7	7.3	7.8	8.3
RLX-9	Greek Orthodox Church of St. Nichols **	17 Meriam St.	8.0	7.2	7.7	8.3
RLX-10	Chabad Center **	9 Burlington St.	30.8	29.1	33.8	36.6
RLX-11	Pilgrim Congregational Church	55 Coolidge Ave.	17.9	17.0	19.9	21.7
RLX-12	First Baptist Church of Lexington **	1580 Mass. Ave.	5.2	5.1	5.6	5.9
RLX-13	Jehovah's Witnesses	196 Woburn St.	2.2	2.9	3.2	3.4
RLX-14	Follen Church Society-Unitarian Universalists *	755 Massachusetts Ave.	0.9	2.5	2.8	3.0
RLX-15	Countryside Bible Chapel	480 Lowell St.	2.9	3.4	4.0	4.4
RLX-16	St. Paul Evangelical Church	451 Lowell St.	1.9	2.8	3.3	3.5
SLX-1	Minuteman Regional Vocational High School	758 Marrett Rd.	17.1	17.0	18.1	19.3

Label ¹	Name ²	Address (Lexington)	2012	2017	2025	2035
SLX-2	Maria Hastings School	2618 Mass. Ave.	14.7	15.1	16.3	17.7
SLX-3	Methodist Weekday School	2600 Massachusetts Ave.	17.7	16.3	17.6	18.9
SLX-4	Community Nursery School	2325 Massachusetts Ave.	16.2	14.3	15.4	16.6
SLX-5	Bridge Elementary School**	55 Middleby Rd.	6.7	9.9	10.9	11.9
SLX-6	Lexington High School	251 Waltham St.	6.9	7.4	8.1	8.8
SLX-7	Jonas Clarke Middle School	17 Stedman Rd.	2.8	5.0	5.6	6.2
SLX-8	Estabrook School**	117 Grove St.	10.3	15.1	16.5	17.7
SLX-9	Diamond Middle School	99 Hancock St.	26.8	25.8	30.3	32.8
SLX-10	Fiske Elementary School	146 Maple St.	10.5	10.2	12.1	13.3
SLX-11	Armenian Sisters Academy	20 Pelham Rd.	2.2	3.2	3.5	3.8
SLX-12	Harrington Elementary School	148 Maple St.	0.9	1.6	1.7	1.8

Notes:

1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR.
2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS. Sites are marked with a (†) if they are only listed in the State Register of Historic Places. Sites marked with a (††) contribute to the Lexington Green Historic District.
3. The Lexington United Methodist Church and St. John's Korean United Methodist Church are at the same address.

Source: HMMH

Table D-11 Time Above 55 dB at Noise Sensitive Receptors in Lincoln (minutes)

Label ¹	Name ²	Address (Lincoln)	2012	2017	2025	2035
NLN-1	Walden Pond	Rte. 126, Walden St., Concord Rd.	11.0	22.2	21.3	22.6
NLN-2	Henry Higginson House	44 Baker Farm Rd.	10.0	18.9	16.8	17.8
NLN-3	Daniel Brooks House	Brooks Rd.	28.7	35.0	29.1	30.2
NLN-4	Lincoln Center Historic District	Bedford Rd. Lincoln Rd., Old Lexington Rd. Sandy Pond Rd. Trapelo Rd. Weston Rd.	6.6	10.7	10.1	10.6
NLN-5	Hoar Tavern	268 Cambridge Tpke.	6.3	9.9	10.5	11.3
SLN-1	Carroll School	25 Baker Bridge Rd.	6.7	13.2	11.6	12.3
SLN-2	Hanscom Middle School	Hanscom AFB	93.6	65.9	68.3	70.8
SLN-3	Hanscom Primary School	Hanscom AFB	92.6	64.9	67.5	69.9
Notes: 1. The first letter of the label indicates the nature of each site: H for hospital, N for sites in the National Register of Historic Places and/or State Register of Historic Places, O for other, P for public facilities, R for religious sites, S for schools. Other is the category for sites that town representatives specifically requested be added to the noise receptor list, but do not fit into the other four categories. The second letter indicates the town where the site is located: B for Bedford, C for Concord, LX for Lexington, LN for Lincoln. The labels are unchanged from the 2012 ESPR. 2. Historic districts and cemeteries are evaluated at a central location within the district or cemetery. Sites that are not designated as "N" sites are marked with an asterisk (*) if they are listed in the National Register of Historic Places and two asterisks (**) if they are listed in the State Inventory/MACRIS.						

D.3.2 Total Noise Exposure (EXP)

Tablr D-12 presents detailed total EXP results for 2017 operations and the 2025 and 2035 scenarios, using SELs computed with AEDT version 2d.

Table D-12 Total EXP by Aircraft Group

Aircraft Type/Group		AEDT ¹ TYPE	Total Noise Exposure		
			2017	2025	2035
Civil:					
1	Cessna 500, 501, 525	CNA500	94.7	95.5	96.1
2	Cessna 560	CNA560U	93.1	93.9	94.5
3	Lear 31, 35, 40, 45 ,55 ,60, Hawker Siddely 125-700, -800, - 1000, Sabreliner 65, Falcon 10	LEAR35	103.0	103.9	104.5
5	Lear 24, 25, Hawker Siddely 125-400, -600	LEAR25	80.4	81.3	81.9
7	Gulfstream III	GIV	82.0	82.9	83.5
8	Gulfstream IV, 450	GIV	97.5	98.4	99.0
9	Challenger 600, 604, 300	CL600	100.5	101.3	101.9
10	Challenger 601, Canadair RJ	CI601	96.0	96.8	97.4
11	McDonnell Douglas MD83, Boeing 747, 767, Unknown/Miscellaneous Jets	MD83	87.6	88.4	89.0
14	Douglas DC-9	DC95HW	84.4	85.2	85.8
17	Helicopters	S76	101.1	102.1	102.4
18	Large Turboprop	C130	80.3	81.4	82.2
19	Piper PA-42, PA31T, Cessna 441, 424, Twin Engine Turboprop	CNA441	81.9	83.0	83.8
20	Twin Engine Piston Prop	BEC58P	94.7	94.7	94.8
21	Single Engine Piston Prop	SEPMIX	104.3	104.0	104.0
22	Westwind/ Astra 1124, 1125, Gulfstream G150, 280	IA1125	92.2	93.1	93.7
25	Cessna 650	CIT3	84.2	85.1	85.7
26	Falcon 200, 2000, 50/900, 7X	CNA750	100.0	100.8	101.4
29	Beech 1900, Dornier 328, Embraer 120	1900D	88.9	93.7	98.4
30	Saab 340	SF340	61.1	62.2	63.0
33	Beech 200, 300, 350, 90, Dehavilland DHC-6	DHC6	101.3	102.4	103.2
36	Airbus 319, 320, 321, Embraer 190	A319-131	80.7	81.6	82.2

Aircraft Type/Group		AEDT ¹ TYPE	Total Noise Exposure		
			2017	2025	2035
37	Gulfstream V, 550, 650	GV	96.2	97.1	97.7
39	Gulfstream II	GIIB	86.4	87.3	87.9
40	Cessna 750, IAI Galaxy, Hawker 4000, Dornier 328J	CNA750	98.4	99.2	99.8
41	Boeing 737-400, -700, -800	737400	96.7	97.5	98.1
42	Boeing 757	757RR	94.2	95.0	95.6
43	Embraer Phenom 300, Cessna 550 Bravo, Eclipse 500	CNA55B	95.0	95.9	96.5
44	Cessna 506XL	CNA560XL	98.6	99.5	100.1
45	Beech 400, Mitsubishi MU-300	MU3001	95.9	96.8	97.4
46	Cessna 680, 700	CNA680	93.3	94.1	94.7
47	Embraer 135, 145	EMB145	86.8	87.6	88.2
48	Bombardier Global Express, 5000	BD-700-1A10	95.6	96.5	97.1
49	Cessna 510, Embraer Phenom 100, Legacy 500	CNA510	86.8	87.7	88.3
50	Eclipse 500	ECLIPSE500	78.0	78.8	79.4
Military:					
2M	UC-35 (Cessna 560)	CNA560U	72.3	72.3	72.3
3M	C-21 (Lear 35)	LEAR35	82.6	82.6	82.6
4M	HU-25 (Falcon 20)	FAL20	77.9	77.9	77.9
5M	C-11 (Gulfstream II), T-38	LEAR25	92.2	92.2	92.2
7M	C-20 (Gulfstream IV)	GIV	66.5	66.5	66.5
11M	Unknown/Miscellaneous Jets	COMJET	75.2	75.2	75.2
14M	C-40, Boeing 757	DC9Q9	84.3	84.3	84.3
15M	Boeing 707	707	94.0	94.0	94.0
17M	Helicopters	S70	89.2	88.1	88.1
18M	C-130, V-22	C130	85.6	85.6	85.6
19M	Twin Engine Turboprop	CNA441	79.2	76.8	76.8
20M	Twin Engine Piston Prop	BEC58P	69.0	69.0	69.0
21M	Single Engine Piston Prop	SEPMIX	77.0	75.1	75.1
24	F-15, F-18, EA-6	F15E20	101.9	101.9	101.9
37M	C-37 (Gulfstream V)	GV	73.5	73.5	73.5

Aircraft Type/Group	AEDT ¹ TYPE	Total Noise Exposure		
		2017	2025	2035
All civil aircraft except single piston		111.1	112.0	112.7
All civil aircraft		111.9	112.7	113.3
All military aircraft		103.3	103.3	103.3
All civil and military aircraft except single piston		111.8	112.6	113.2
All civil and military aircraft		112.51	113.1	113.7
Source: HMMH				
Notes: 1.AEDT = Aviation Environmental Design Tool 2. SEPMIX = 75% GASEPF, 25% GASEPV				

Appendix E — Air Quality

Appendix E is intended to supplement and provide background information for the materials contained in Chapter 8 Air Quality.

E.1 Emissions Modeling Tools

Analysis of current conditions and modeling of future year scenarios for aircraft-related emissions in the 2017 *ESPR* was completed using the FAA's Aviation Environmental Design Tool (AEDT). This updated tool replaced the older Emissions and Dispersion Modeling System (EDMS) which was used in prior *ESPRs*.

E.1.1 Differences between AEDT and EDMS

AEDT is the most recent tool developed by the FAA for modeling noise and emissions at airports. It is based on the best current available science for calculating aircraft-related emissions (from main aircraft engines, auxiliary power units, and ground support equipment). As described in Chapter 7 – Noise, AEDT is also used to assess and model airport noise. AEDT capability provides a user the ability to simultaneously model aircraft noise and emissions, replacing the legacy tools of EDMS and the Integrated Noise Model (INM). Due to methodological updates and the inclusion of more recent data, results between the various models may vary.

Many updates have been incorporated into AEDT from EDMS. An overview of the main differences is provided below:

- ⇒ **Input Data** – Aircraft take-off weight values are somewhat different in each model, and take-off weight affects emissions. This in turn results in potential differences in aircraft emissions during the take-off mode of operations. Unlike EDMS, AEDT does not allow adjustments in take-off weights.
- ⇒ **Aircraft Operational Modes** – AEDT provides a more detailed output on aircraft operational modes than EDMS, which results in more specific operational characteristics and thus a difference in emissions estimates.
 - In EDMS, the four primary operational modes are: (1) Take-Off, (2) Climb Out, (3) Cruise, and (4) Taxi-Idle.
 - In AEDT, there are thirteen operational modes, including: (1) Take-Off, (2) Climb Taxi, (3) Climb Ground, (4) Climb Below 1,000 Feet, (5) Climb Below Mixing Height, (6) Climb Below 10,000 Feet, (7) Cruise Above 10,000 Feet, (8) Descend Below 10,000 Feet, (9) Descend Below Atmospheric Mixing Height, (10) Descend Below 1,000 Feet, (11) Descend to Ground, (12) Descend Taxi, and (13) Full Flight.

- ⇒ **Time-In-Modes (TIM)** – Due to the changes described in the Operational Modes section above and changes in how aircraft “climb out” and cruise times are calculated in AEDT, there are also differences in TIM between the two models. This difference affects the total emissions calculated for Landing and Takeoff (LTO) cycles. The AEDT TIM updates provide more accurate emissions estimates than EDMS.
- ⇒ **Emission Factors** – Both models contain many aircraft engine emission factors that are based on engine model, fuel type and operational mode. Most factors are identical across the models but there are some differences. If a particular fleet mix at an airport contains a higher percentage of aircraft with updated emissions factors, the difference in emissions estimates between AEDT and EDMS will be greater.
- ⇒ **Missing Aircraft / Engine Combinations** – There are some aircraft and engine combinations that were included in EDMS but are not in AEDT - particularly for newer aircraft. Again, the combinations included in AEDT are based on the most recent data available.
- ⇒ **Fuel burn** – The AEDT fuel burn estimates were updated and differences between EDMS will vary based on aircraft type. These differences along with changes discussed above will affect emission estimates.

Many of the changes in emissions estimates between EDMS and AEDT can be attributed to the differences between the models, as described above, specifically related to variations in the options for operational modes between the models, and the change in engine emission factors and fuel burn based on best available data. The FAA continues to update the AEDT tool to enhance the user interface and to improve the data when available in order to allow for increased accuracy.

E.1.2 Aircraft Fleet and Operational Data Used in AEDT 2d

The Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT), Version 2d (AEDT 2d) was used in support of the 2017 *ESPR* air quality analysis. Appendix D, Noise, Table D-1 contains the data that were used in AEDT 2d to represent actual conditions at Hanscom Field in 2017 while Tables D-2 and D-3 contain 2025 and 2035 forecast conditions, respectively. These data include aircraft group, sector (i.e. civil or military), AEDT aircraft type, engine type, departures and landings by day and night in average annual day (AAD), annual landing takeoff cycles (LTOs), and annual touch and goes (TGOs).

E.2 Regulatory Context

This section describes relevant air quality regulations and programs at the state and federal levels in addition to the regulations discussed in Chapter 8, Air Quality.

E.2.1 Status of Lead Regulations and Research

Low-lead fuel, also known as aviation gasoline (avgas), used in some general aviation (GA) aircraft remains a source of airport-related lead in the atmosphere. Lead emissions can enter the body through inhalation or be ingested via plants, water or soil. The EPA is currently conducting an analysis, including modeling and monitoring, to evaluate whether lead emissions from avgas could cause or contribute to air pollution that endangers public health and welfare (also called an “endangerment finding”) which could lead to additional regulations in the future.

The most recent lead NAAQS were set in 2008, when the EPA revised them from the previous level of 1.5 micrograms (μg) per cubic meter (m^3) to $0.15 \mu\text{g}/\text{m}^3$ (measured over a rolling 3-month average), finding that serious health effects occur at much lower levels in the blood stream than previously identified. Since then, the EPA has reviewed the lead NAAQS, and in 2016 issued a determination confirming that the 2008 NAAQS will be retained.¹ Periodic strengthening of the standard is intended to protect public health, specifically protecting at-risk groups in the population, including children.

In March of 2012, the environmental group Friends of the Earth (FOE) filed a lawsuit against the EPA stating that EPA has unreasonably delayed its response to FOE’s 2006 petition asking the agency to make an endangerment finding and propose standards for lead emissions of aircraft. The agency’s position to delay making an endangerment finding was upheld by the courts. Since then, FOE and other environmental groups again petitioned the EPA in 2014 to request that the agency make an endangerment finding. In its January 2015 response, the EPA responded that it was delaying making an endangerment finding due to the need for additional research.²

As of April 2019, EPA has released no proposed endangerment finding and is still reviewing the issue.³ If EPA does finalize an endangerment finding, the agency would then establish standards for lead emissions from piston engine aircraft. FAA ultimately would develop regulations to ensure compliance with the standards and would be required to establish fuel standards to control lead emissions.

In addition to the 2008 lead NAAQS update, the EPA mandated a 1-year lead monitoring study at 15 selected airports that emit less than one ton of lead annually. EPA requires lead monitoring by state agencies if airport emissions of lead exceed one ton.⁴ Although initially

¹ “Review of the National Ambient Air Quality Standards for Lead”. Federal Register 81-201 (October 18, 2016), page 71906. Available from Government Publishing Office at www.govinfo.gov.

² U.S. EPA. January 2015. *Response Memorandum to the 2014 Petition from Friends of the Earth, et al.* <https://www.epa.gov/sites/production/files/2016-09/documents/ltr-response-av-ld-foe-psr-oaw-2015-1-23.pdf>

³ U.S. EPA. August 2017. *Regulations for Lead Emissions from Aircraft*. <https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-lead-emissions-aircraft>

⁴ U.S. EPA. January 2015. *Overview: Airport Lead Monitoring Program*. <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100LJDW.PDF?Dockey=P100LJDW.PDF>

considered by the EPA, Hanscom Field was not included in the final study list. Nantucket Memorial Airport is the closest airport in proximity to Hanscom that was on the EPA list with an estimated lead emission level of 0.76 tons per year based on the 2008 National Emissions Inventory.⁵ EPA and MassDEP commenced a yearlong lead monitoring program at Nantucket in February of 2012 and completed monitoring at the airport in February of 2013.

The highest reported 3-month lead concentration at the Nantucket airport was 0.0209 $\mu\text{g}/\text{m}^3$ and the highest 24-hour concentration was 0.04 $\mu\text{g}/\text{m}^3$, well below the 2008 standard of 0.15 $\mu\text{g}/\text{m}^3$. Most recent data collected by MassDEP shows a quarterly maximum concentration of 0.017 $\mu\text{g}/\text{m}^3$ in 2016 at the Boston - Harrison Avenue monitor location which is also well below the standard. This is the only site at which MassDEP currently monitors lead since Massachusetts is in attainment for lead, based on the NAAQS.

The EPA provided a summary of a full year of lead concentration data measured at 17 U.S. airports in January of 2015. The results show that "For all but one airport (the Reid-Hillview airport) the [lead] design value is unchanged from the EPA's 2013 Program Update on Airport Lead Monitoring, either because no more data were collected or because higher concentrations were not measured. Because of the concentrations measured, four airports will continue monitoring for lead.

The FAA issued interim guidance on mitigating public risks from lead emissions associated with avgas in June of 2013.⁶ The guidance is provided for FAA identified airports of concern based on a review of the EPA monitoring results and for any operator concerned about lead emissions.

Hanscom is not identified as an airport of concern based on the FAA preliminary monitoring studies. The FAA continues to work with the aviation industry and EPA to develop a viable, safe, and economical unleaded fuel replacement as part of the transition from leaded avgas.

Status of Lead Free Avgas in the United States

The FAA is currently working through a collaborative industry-government program, known as the Piston Aviation Fuels Initiative (PAFI), to facilitate and evaluate development of an alternate fuel for leaded aviation gasoline.⁷ As of May 2019, development of PAFI fuels is ongoing; research and testing of alternatives continue at the FAA's William J. Hughes Technical Center in Atlantic City, NJ. Consideration of each alternative fuel involves thorough evaluation of its production viability, distribution, cost, and availability of alternatives, as well as possible

⁵ U.S. EPA. November 2010. *Memo: Selection of Airports for the Airport Monitoring Study*. <https://www3.epa.gov/ttnamti1/files/ambient/pb/Memo-Selection-of-Airports.pdf>

⁶ Federal Aviation Administration. June 2013. *Interim Guidance on Mitigating Public Risks Associated with Lead Emissions from Avgas*. http://www.faa.gov/airports/environmental/policy_guidance/media/leadMitigationMemoJune2013.pdf

⁷ FAA Unleaded AVGAS Transition Aviation Rulemaking Committee (UAT ARC). February 2012. *Final Report, Part I: Body Unleaded AVGAS Findings & Recommendations*. http://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Avgas.ARC.RR.2.17.12.pdf

environmental and health impacts. Once a viable alternative is found, PAFI test data will serve as qualification and certification data for the fuel producer to obtain American Society for Testing and Materials (ASTM) Production Specification. The data will also serve as a basis for FAA to authorize aircraft and engines to operate on the unleaded alternative fuel.⁸ PAFI plans to facilitate deployment of the alternative when a suitable alternative is identified.⁹

On June 10, 2013, FAA issued a request for candidate fuel producers to submit alternative fuel formulations to be evaluated as potential replacement to 100LL. This announcement resulted in a response from six fuel producers, proposing seventeen candidate fuels. Testing was planned in two phases: Phase 1 involved fuel testing, which includes laboratory testing, materials compatibility testing, limited engine testing, as well as environmental and toxicity assessment and Phase 2 involves full-scale engine and aircraft flight-testing. In September 2014, four of the alternatives were accepted into PAFI Phase 1 testing, which occurred from December 2014 through November 2015. Two fuels made it through to Phase 2 testing which began in March 2016.

Phase 2 evaluation continued through 2018 with half of the engine and one-third of the flight-testing component completed as of June 2018. Due to differences identified concerning performance of the alternative fuels compared to 100LL fuel, further evaluation by the fuel producers was warranted in order to mitigate issues, causing a delay in testing. As a result, the testing completion date for the PAFI replacement program was pushed from December 2018 to 2020. In September 2018, one of the producers announced that they would no longer pursue their PAFI fuel formulation, but the other producer continued to optimize their formula, and testing is slated to continue. As a result, the FAA is accepting and evaluating data from fuel producers outside of the PAFI program, and viable options may be pursued through Cooperative Research and Development Agreements.

In light of the necessity for airport operators to continue use of leaded Avgas until a replacement is found, the Airport Cooperative Research Program (ACRP) has published guidance and a tool to inventory lead emissions at general aviation airports and also presents strategies that may be employed to reduce lead emissions and mitigate emissions impacts once they are quantified. This guidance is contained within two reports: *ACRP Report 133: Best Practices Guidebook for Preparing Lead Emission Inventories from Piston-Powered Aircraft with the Emission Inventory Analysis Tool*, published in 2015, and *Report 162: Guidebook for Assessing Airport Lead Impacts*, published in 2016.¹⁰

⁸ PAFI Program. July 2017. *Presentation on the Future of Unleaded Aviation Gasoline*.

https://www.faa.gov/about/initiatives/avgas/media/media/PAFI_2017.pdf

⁹ FAA Unleaded AVGAS Transition Aviation Rulemaking Committee (UAT ARC). February 2012. *Final Report, Part I Body: Unleaded AVGAS Findings & Recommendations*.

https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Avgas.ARC.RR.2.17.12.pdf

¹⁰ Airport Cooperative Research Program publications can be found at <http://www.trb.org/ACRP/ACRP.aspx>.

E.2.2 Ultrafine Particulate Matter and Black Carbon

To date, there are no federal or MassDEP air quality regulations that exist for UFP due to limited health studies to substantiate an air quality standard, however the EPA has begun to consider developing a standard for UFPs on the basis of unique physical attributes and potential human health hazards. The agency is currently reviewing existing NAAQS for PM₁₀ and PM_{2.5}, which provides an opportunity to include UFPs; a determination is due by 2022. It is generally understood that smaller particles, which are inhaled into the lungs, pose a greater health risk impact compared to larger particles, but specific levels associated with impacts to human health of UFPs have not been determined. While studies are ongoing to examine the health impacts of UFP exposure, the results may not be sufficient or clear enough for the EPA to develop a standard. Therefore, there is continued need to research UFPs and their potential health effects.

There are a number of recent studies that examine air quality around airports which include consideration of UFPs. The Los Angeles World Airports (LAWA) released the first major airport air emissions apportionment study of its kind in 2013, the Air Quality and Source Apportionment Study (AQSA). The airport spent over \$5 million on the study and measured over 400 different species of air emissions to determine LAX's contributions to local air quality. Its major finding concerning UFP was that potential health effects of UFPs are not sufficiently understood to develop health-based ambient air quality standards, and that chemical differences between UFP emissions from jet and vehicle exhaust should be taken into account in future studies.¹¹

Toronto Pearson International Airport released the results of its Air Quality and Human Health Risk Assessment (HHRA) Study in 2015. This study involved development of an emissions inventory and pollutant dispersion modeling for airport property and surrounding communities, to understand airport contributions. This information was used to assess the human health risks related to exposure to airport-related air pollutants, accounting for UFPs within assessment of PM_{2.5}. The HHRA study concluded that in some limited circumstances, predicted levels of certain air pollutants exceeded acceptable risk levels. However, the circumstances in which those levels were predicted to occur were based on exposure estimates that are highly unlikely in real-life (i.e. this scenario assumed the most sensitive populations were exposed to the highest measured pollutant levels on a consistent basis throughout their lifetime). The other circumstance in which predicted levels of certain air pollutants would exceed acceptable risk levels were based on very intermittent events. Ultimately, results show that the emissions from the airport do not represent a significant health risk.¹²

¹¹ Los Angeles World Airports. June 2013. *LAX Air Quality and Source Apportionment Study, Volume 1. Executive Summary*. <https://www.lawa.org/-/media/lawa-web/environment/files/vol-1---lax-aqsas-2014-03-06s.ashx?la=en&hash=6CF228F6BF492A610058352C8BAD5F520A04E5A3>

¹² Greater Toronto Airport Authority. August 2015. *Human Health Risk Assessment (HHRA) Report*. [https://torontopearson.com/uploadedFiles/Pearson/Content/About_Pearson/Environment/Intrinsic%20Environmental%20Sciences%20-%20Toronto%20Pearson%20Air%20Quality%20Study%20-%20HHRA%20Report%20\(Final%20-%20August%202015\).pdf](https://torontopearson.com/uploadedFiles/Pearson/Content/About_Pearson/Environment/Intrinsic%20Environmental%20Sciences%20-%20Toronto%20Pearson%20Air%20Quality%20Study%20-%20HHRA%20Report%20(Final%20-%20August%202015).pdf)

In 2015, The Airport Cooperative Research Program (ACRP) published *Report 135: Understanding Airport Air Quality and Public Health Studies Related to Airports*. This report provides a concise review of air quality studies and related literature, in addition to identifying health impacts and risks, and putting these concepts in the airport air quality context. In relation to UFP, the study concludes that based on reviewed public health literature, “ultrafine concentrations tend to be highly elevated near an airport (near runways) with persistence above background levels at distances of 600 meters downwind of an airport. As such, ultrafine [particulate matter] generated by airports is suspected of having a broader impact than that generated by roadway vehicles.”

Zurich Airport, located in Switzerland, conducted a recent study to understand the UFP concentrations near the airport and how to monitor these types of particles. Results of the study were released in 2017; it determined that UFP concentrations vary greatly over time and space and are heavily affected by wind direction and speed. It determined that short-term monitoring is not sufficient due to high variability of particle concentration, and that long-term measurement is preferable to capture airport activity levels and weather changes over time, also ensuring that wind speed and direction is simultaneously captured.¹³

The FAA Center of Excellence for Alternative Jet Fuels & Environment (ASCENT) funded ongoing project, *Project 18: Community Measurements of Aviation Emissions Contribution to Ambient Air Quality* studies the impacts and distribution of UFP specifically associated with arrival flight paths into Boston Logan International Airport. Boston University School of Public Health researchers who designed and implemented new near-airport monitoring protocols intended to determine the impact of arriving aircraft on UFP concentrations leads the study. Researchers will utilize regression analysis to account for lags between flight activity and weather conditions, and their effect on UFP concentrations. Field monitoring and analysis for this study is ongoing.¹⁴

Black Carbon

While particulate matter at all sizes is comprised of multiple components, one of the more significant components is Black Carbon (BC). BC particles, also referred to as soot, form as a result of incomplete combustion, particularly at the higher temperatures at which aircraft burn fuel. Therefore, BC emissions are common from aircraft. BC from aviation activities largely contributes to an increase in smaller particle concentrations (i.e., PM_{2.5} and UFPs). BC is known to have negative impacts on both human health and the environment. According to the EPA, BC is associated with respiratory distress, cardiovascular disease, cancer and birth defects. A

¹³ Flughafen Zürich AG. 2017. *Ultrafine Particle Measurements at Zurich Airport*. https://www.zurich-airport.com/~media/flughafenzh/dokumente/das_unternehmen/laerm_politik_und_umwelt/2017-03_zurich-airport_ufp_study.pdf

¹⁴ ASCENT. 2017. *Project 18: Community Measurements of Aviation Emissions Contribution to Ambient Air Quality, Annual Report 2017*. <https://ascent.aero/documents/2018/06/ascent-018-2017-annual-report.pdf/>

2009 study using air quality monitors near an airport showed that airports can contribute between 24 and 28 percent of total BC within 4 kilometers.¹⁵ However, modeling studies, commonly used to ascertain the extent of impacts on human health and the environment have shown the level of contribution by an airport to be less, or between 2 – 5 percent. Research has been undertaken to determine whether monitoring or modeling BC is more effective for evaluating BC contributions from airports.¹⁶ To understand the extent of impacts from airport related BC emissions, more research is needed. Research should focus on improving emissions estimates of BC from airports and improving modeling techniques. FAA conducts research on BC through the ASCENT program.

E.2.3 Federal Mobile Source Emissions Standards and Regulations

The EPA has enacted various vehicle emissions standards and fuel standards to improve air quality and reduce airborne pollutant emissions from mobile sources.

As described in Chapter 8, the Corporate Average Fuel Economy (CAFE) standards were enacted in 1975 with the intention of improving the average fuel economy of passenger cars and light trucks, and decreasing national fuel consumption. Today, the standards set fleet-wide average fuel economy requirements for automakers manufacturing passenger cars and light trucks, as well as medium and heavy-duty vehicles. The standards are regulated by the National Highway Traffic Safety Administration (NHTSA) and supported by EPA GHG standards.¹⁷

In 2011, the federal government and thirteen major automakers agreed to incremental tightening of the CAFE standards with a goal to increase fuel economy of cars and light trucks to 54.5 miles per gallon by model year 2025. This resulted in updated CAFE standards for model years 2017-2025, published in August 2012. The agreement also included a requirement for a midterm evaluation of the updated standards in order to review available technologies, acknowledge market trends, and assess industry progress.

This review included a draft technical assessment report, published collaboratively by the EPA, NHTSA, and California Air Resources Board (CARB) and released in July of 2016. The report evaluated whether the industry could reach the forthcoming 2022 to 2025 model year standards. The results of the assessment show that the initial goal of 54.5 miles per gallon is

¹⁵ Dodson R.E.; Houseman E.A.; Morin B.; Levy J.I. *An Analysis of continuous black carbon concentrations in proximity to an airport and major roadways*. Atmos. Environ. 2009, 43243764-3773.

¹⁶ Arunachalam S.; Valencia A.; Yang D.; Davis N.; Baek B.H.; Dodson R.E.; Houseman A.E.; Levy J.I.; *Comparing Monitoring-Based and Modeling-Based Approaches for Evaluating Black Carbon Contributions from a US Airport*. Air Pol. Mod. 2011, 619-623.

¹⁷ U.S. Department of Transportation. August 2014. *Corporate Average Fuel Economy (CAFE) Standards*. <https://www.transportation.gov/mission/sustainability/corporate-average-fuel-economy-cafe-standards>

not realistic, and that a revised goal of 50 to 52.6 miles per gallon is more achievable.¹⁸ In April of 2018, EPA announced that the midterm evaluation process was complete and published a final determination that the model year 2022-2025 standards under the Clean Air Act are no longer appropriate based on available information. The EPA proposes revisions to the CAFE standards published in 2012 to make them less stringent. As of fall 2018, the EPA continues collaboration with NHTSA on an updated standard to submit through the public rulemaking process, including public notice and comment periods, before a final agency action is taken.¹⁹

In 2014, EPA finalized a rule, which set new emissions standards, including provisions that reduce the allowable sulfur content of gasoline starting in 2017. This rule, the Tier 3 Vehicle Emission and Fuel Standards, places stricter limits on tailpipe exhaust and reduces gasoline sulfur content down to 10-ppm average. The rule is expected to reduce sulfur content in gasoline by 60 percent compared to the existing Tier 2 sulfur gasoline standard of 30 ppm. Based on EPA estimates, the rule will decrease nitrogen oxides and volatile organic compounds by 80 percent and per-vehicle particulate matter by 70 percent.²⁰

E.2.4 Massachusetts Mobile Source Emissions Standards and Regulations

MassDEP has enacted various vehicle emissions and fuel standards designed to improve air quality and reduce airborne pollutant emissions from mobile sources, such as the enhanced Motor Vehicle Emissions Inspection and Maintenance (I/M) Program, which requires annual emissions and safety tests. The program, known as Massachusetts Vehicle Check, requires vehicles to pass an annual emissions test if they have an onboard diagnostic system and were manufactured after model year 2002.²¹ The inspection consists of an on-board diagnostic test (OBD) which assesses the vehicles' on-board computer, downloads the data, and identifies any systems malfunctions. It also includes an opacity test for medium and heavy-duty vehicles that are not equipped with OBD systems. Under the enhanced I/M program, testing is conducted annually and is designed to ensure vehicles are operating efficiently, while identifying and requiring repairs to high polluting vehicles.

As described in Chapter 8, the Commonwealth of Massachusetts has also adopted other state programs to reduce emissions from mobile sources, including the California Low Emissions Vehicle (LEV) program and the California Zero Emissions Vehicle (ZEV) program:

¹⁸ U.S. EPA, NHTSA, and CARB. July 2016. *Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025*. <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF>

¹⁹ U.S. EPA. October 2018. *Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emissions Standards for Model Years 2022-2025*. <https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas>

²⁰ U.S. EPA. April 2014. *40 CFR Parts 79, 80, 85, et al. Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards; Final Rule*. <https://www.gpo.gov/fdsys/pkg/FR-2014-04-28/pdf/2014-06954.pdf>

²¹ Mass.gov. *Basic Inspection Information*. <https://www.mavehiclecheck.com/motorists-basicinfo>

- ⇒ The California Low Emissions Vehicle (LEV) program imposes emission limits that are more stringent than the Federal Motor Vehicle Control Program (FMVCP). The program requires that most new vehicles be equipped with certified advanced emission control systems, including passenger cars, light-duty trucks, and sport utility vehicles (1995 and newer). Massachusetts' law requires the Commonwealth to adopt the stricter of the federal or California emission standards for motor vehicles.
- ⇒ California Zero Emissions Vehicle (ZEV) program, effective in 2007. This program requires an increasing percentage of new vehicles sold in Massachusetts be certified to meet certain emissions limits. The MassDEP revised the ZEV program in 2009, requiring automobile manufacturers to comply with lower fleet average greenhouse gas (GHG) emissions levels.
- ⇒ Massachusetts recently updated the ZEV action plan in 2018 along with eight other states, reaffirming their commitment to ZEV implementation with a goal of 5 million more ZEVs on their collective roads by 2025.²²

These regulations and standards are intended to further reduce mobile source emissions while increasing the prevalence of alternative fuel vehicles such as hybrid, electric, and biodiesel vehicles in the fleet mix. Alternative fuel vehicles are more efficient, resulting much lower emissions, compared to conventional gasoline and diesel vehicles. As these vehicles replace older, less efficient vehicles, emissions are expected to decrease.

Diesel Engines

In 2004, the EPA implemented a rule that requires more stringent controls for non-road diesel engines. These standards followed the Tier 3 emissions standards for nitrogen oxides and hydrocarbons for non-road vehicles that were introduced in 1998 and were phased into use between 2006 and 2008. The Tier 4 exhaust emission standards, were phased-in between 2008 and 2014, and intended to cut air pollution emissions from both on-road and non-road diesel engines by over 90 percent. As part of these regulations, ultra-low sulfur diesel fuel, containing no more than 15 ppm sulfur content, for on-road diesel vehicles was phased-in from 2006 to 2010.

Reformulated Gasoline and Vapor Recovery Systems

Massachusetts has adopted the federal regulations for reformulated gasoline, although it is not a required area under the Clean Air Act. Reformulated gasoline (RFG) is designed to produce lower emissions of toxic substances from evaporation and burn cleaner than conventional gasoline, resulting in improved air quality and less smog-forming pollutants.

²² Massachusetts Department of Environmental Protection. *Multi-State ZEV Action Plan: Accelerating the Adoption of Zero Emissions Vehicles*. 2018-2021. https://www.mass.gov/files/documents/2018/06/21/zevplan18_0.pdf

In 2000, Phase II of the reformulated gasoline program went into effect, implementing more stringent standards.²³ In 2006, Massachusetts phased out the use of methyl tert-butyl ether (MTBE), a gasoline additive designed to boost octane levels, due to environmental and health concerns. MTBE was found in groundwater due to leaky underground tanks, leading to drinking water safety concerns, and resulting in legislation to substitute MTBE with ethanol. Currently, RFG is being blended with ethanol in Massachusetts.

MassDEP Stage I and II Vapor Recovery Program is intended to prevent gasoline evaporation during fuel deliveries and while filling vehicles at gasoline dispensing stations. In January of 2015, amendments to the program required that Stage II gasoline vapor recovery systems be decommissioned at gasoline dispensing stations by early 2017. This regulation was based on the EPA rule that Stage II vapor recovery was no longer cost effective. In addition, Massachusetts finalized Stage I regulatory revisions requiring that gas dispensing facilities with Stage I systems must meet the California Air Resource Board requirements for Stage I Enhanced Vapor Recovery (CARB EVR), as well as maintain monitoring systems for vapor leaks.²⁴

Massport does not own or operate fuel distribution facilities at Hanscom Field. A survey of fixed based operators (FBOs) at Hanscom Field found that vapor recovery is being used on all fuel storage tanks subject to MassDEP regulation and that Stage II vapor controls are used at all gasoline-dispensing facilities.

E.2.5 Massachusetts Climate Change and Greenhouse Gas Emissions Regulatory Framework

Massachusetts acknowledges climate change as an important environmental and economic issue, and has taken a number of actions designed to address both the Commonwealth's contribution to climate change as well as preparing for the anticipated effects of climate change. State regulatory actions addressing climate change include:

- ⇒ The Massachusetts Climate Protection Plan, first developed in 2004, aimed to address GHG emissions and improve energy efficiency. The plan supported near-term actions to protect the climate, reduce pollution and energy demand, and to stimulate job growth through the development of sustainable energy resources. Massport was one of 15 state agencies and authorities that participated in development of the initial action plan.
- ⇒ Massachusetts Global Warming Solutions Act (GWSA), which was signed into law in 2008, and established a comprehensive regulatory program to address climate change. The GWSA set targets for GHG emissions reductions of 10- 25 percent by 2020 and 80

²³ U.S. EPA. August 2018. *Reformulated Gasoline*. <https://www.epa.gov/gasoline-standards/reformulated-gasoline>

²⁴ MassDEP. January 2015. *Fact Sheet: MassDEP's Revised Stage I & II Regulations*. <https://www.mass.gov/files/documents/2016/08/tv/s1and2-fs15.pdf>

percent by 2050 compared to 1990 levels.²⁵ To aid in implementing the GWSA, the MassDEP issued rules in December of 2008 for mandatory GHG reporting requirements from a wide array of sources. The rule required certain facilities to register with the MassDEP by April of 2009 and report, certify, and verify emissions annually starting in April of 2010.

- ⇒ Executive Order 569, signed by Governor Baker in 2016 to address climate change and the increasing threat of extreme weather events to the state's economy.²⁶ The Order acknowledges that the transportation sector continues to be a significant contributor of GHG emissions in Massachusetts, and is the only sector identified in the GWSA in which emissions have increased over time. The Order tasks transportation agencies with collaborating to develop regional policies aimed at reducing GHG emissions.
- ⇒ As required by Executive Order 569, the state published a Climate Adaptation Plan, which was adopted in September 2018 as the State Hazard Mitigation and Climate Adaptation Plan.²⁷

In addition, the Massachusetts Executive Office of Energy and Environmental Affairs revised the "MEPA Greenhouse Gas Emissions Policy and Protocol" effective May of 2010. The revised policy requires certain projects under MEPA review, not specific to this *2017 ESPR*, to quantify potential annual GHG emissions for the baseline and preferred alternative. It requires analysis of project specific impacts and evaluation of possible mitigation measures intended to minimize or mitigate potential GHG emissions from the preferred alternative.

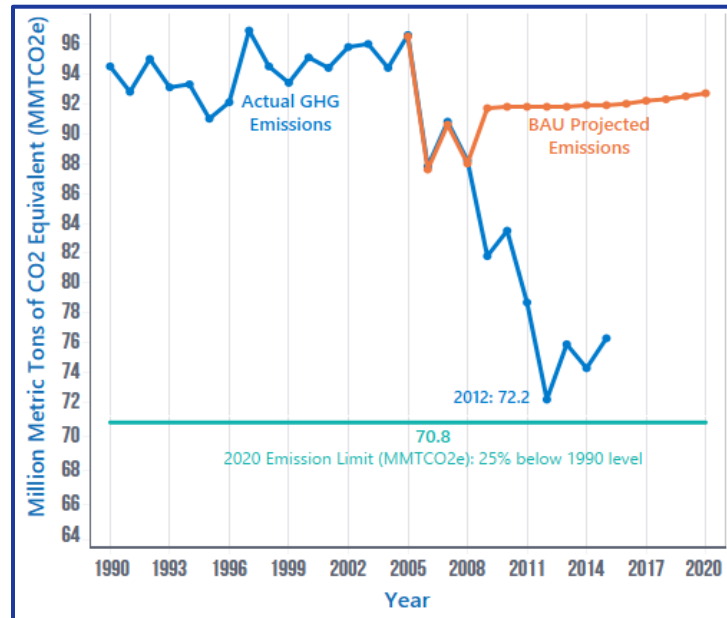
²⁵ Commonwealth of Massachusetts. 2008. *An Act Establishing the Global Warming Solutions Act*. <https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter298>

²⁶ Mass.gov. September 2016. *Governor Charlie Baker, Executive Order No. 569: Establishing an Integrated Climate Change Strategy for the Commonwealth*. <https://www.mass.gov/executive-orders/no-569-establishing-an-integrated-climate-change-strategy-for-the-commonwealth>

²⁷ Mass.gov. 2018. *Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan*. <https://www.mass.gov/service-details/massachusetts-integrated-state-hazard-mitigation-and-climate-adaptation-plan>

MassDEP recently conducted a state-wide GHG emissions inventory of data from 1990 to 2015, which determined that GHG emissions have decreased 19 percent from approximately 94 million metric tons, or MTs (MMT) of CO₂ equivalent to less than 75 MMT, as shown in Figure 8-4. The decline in emissions is attributable to numerous factors including the economic downturn, changing fuel prices, and implementation of energy efficient measures. Based on the 2015 inventory for Massachusetts, the transportation sector comprised approximately 39% of the GHG emissions, followed by residential at 26 percent, commercial at 19 percent, industrial at 13 percent, and other at 2 percent.²⁸

Figure E-1 Massachusetts GHG Emissions [Actual vs. Business as Usual (BAU)]



Source: <https://www.mass.gov/service-details/ma-ghg-emission-trends>

While not required under the listed regulations to prepare an annual GHG emissions inventory, the Secretary's Scope Certificate for the 2017 *ESPR* included this as a component of the air quality analysis. The methodology used to develop the Hanscom Field GHG emissions inventory mirrors the methodology used by Massport for Logan Airport, and is described in Chapter 8.

E.3 Motor Vehicle Emissions

For the 2017 *ESPR* analysis, the motor vehicle emission factor model MOVES2014a was used. The resultant emission factors were multiplied by average daily vehicle miles to calculate daily emissions. Emissions factors from the mesoscale traffic analysis done in MOVES2014a are included as Table E-1, Table E-2, and Table E-3 for existing conditions in 2017, as well as forecast conditions in 2025 and 2035, respectively.

²⁸ Mass.gov. Massachusetts greenhouse gas emission trends. <https://www.mass.gov/service-details/ma-ghg-emission-trends>

Table E-1 2017 Mesoscale Analysis – Hanscom Field Traffic

Link	Distance (miles)	AM Peak	PM Peak	ADT	Daily VMT	Speed (mph)	Vehicle Emission Factors 2017 (g/mile)							
							CO	CO ₂	VOC	NO _x	PM ₁₀	PM _{2.5}	CH ₄	N ₂ O
Airport Road	0.32	0	0	0	0	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105
Bedford Road	0.35	6	7	70	24.5	35	2.508	349.315	0.063	0.255	0.010	0.009	0.004	0.100
Concord Turnpike	0.6	21	16	210	126	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Hanscom Drive	0.65	74	73	740	481	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105
Hartwell Ave	1.24	7	4	70	86.8	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Hartwell Road	1.62	0	0	0	0	25	2.777	402.444	0.077	0.275	0.012	0.011	0.005	0.118
Mass Ave	0.36	2	2	20	7.2	35	2.508	349.315	0.063	0.255	0.010	0.009	0.004	0.100
Old Bedford Road 1	0.31	26	29	290	89.9	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105
Old Bedford Road 2	0.49	10	2	100	49	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105
Old Mass Ave	0.53	7	4	70	37.1	35	2.508	349.315	0.063	0.255	0.010	0.009	0.004	0.100
Route 2A (1)	0.46	27	23	270	124.2	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 2A (2)	1.67	11	13	130	217.1	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 2A (3)	1.08	32	29	320	345.6	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 2A (4)	0.23	38	36	380	87.4	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 2A (5)	0.92	36	37	370	340.4	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 2A (6)	0.11	36	37	370	40.7	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 2A (7)	0.15	29	33	330	49.5	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 2A (8)	0.18	24	26	260	46.8	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 62 (1)	1.46	0	0	0	0	35	2.508	349.315	0.063	0.255	0.010	0.009	0.004	0.100
Route 62 (2)	1.64	10	22	220	360.8	35	2.508	349.315	0.063	0.255	0.010	0.009	0.004	0.100
Route 62 (3)	1.12	10	22	220	246.4	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105
Route 4/225 (1)	2.1	0	0	0	0	35	2.508	349.315	0.063	0.255	0.010	0.009	0.004	0.100
Route 4/225 (2)	0.56	2	2	20	11.2	40	2.447	341.062	0.060	0.260	0.010	0.009	0.004	0.097
Route 4/225 (3)	0.16	0	0	0	0	25	2.777	402.444	0.077	0.275	0.012	0.011	0.005	0.118
South Road (1)	0.58	0	0	0	0	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105
South Road (2)	0.85	0	0	0	0	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105
Virginia Road	2.13	19	18	190	404.7	30	2.599	364.247	0.069	0.254	0.010	0.009	0.004	0.105

Notes:

1. AM and PM peak volumes are Hanscom Traffic only.
2. ADT based on worst case AM or PM hours which represent approximately 10 percent of daily traffic.
3. Vehicle emissions in kg/yr were based on daily emissions and scaled by 365 days.
4. Total kg/1000 kg were divided by 1,000 for consistency with 2005 ESPR

Table E-2: 2025 Mesoscale Analysis – Hanscom Field Traffic

Link	Distance (miles)	AM Peak	PM Peak	ADT	Daily VMT	Speed (mph)	Vehicle Emission Factors 2025 (g/mile)							
							CO	CO ₂	VOC	NO _x	PM ₁₀	PM _{2.5}	CH ₄	N ₂ O
Airport Road	0.32	0	0	0	0	30	1.66	278.9	0.032	0.1	0.005	0.005	0.003	0.075
Bedford Road	0.35	6	7	70	24.5	35	1.62	267.7	0.030	0.11	0.005	0.004	0.003	0.072
Concord Turnpike	0.6	25	17	250	150	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Hanscom Drive	0.65	59	77	770	500.5	30	1.66	278.9	0.032	0.10	0.005	0.005	0.003	0.075
Hartwell Ave	1.24	11	10	110	136.4	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Hartwell Road	1.62	11	15	150	243	25	1.76	308	0.036	0.11	0.006	0.005	0.003	0.083
Mass Ave	0.36	5	7	70	25.2	35	1.62	267.7	0.030	0.11	0.005	0.004	0.003	0.072
Old Bedford Road 1	0.31	30	34	340	105.4	30	1.66	278.9	0.032	0.11	0.005	0.005	0.003	0.075
Old Bedford Road 2	0.49	11	2	110	53.9	30	1.66	278.9	0.032	0.10	0.005	0.005	0.003	0.075
Old Mass Ave	0.53	7	5	70	37.1	35	1.62	267.7	0.030	0.11	0.005	0.004	0.003	0.072
Route 2A (1)	0.46	32	24	320	147.2	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 2A (2)	1.67	13	13	130	217.1	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 2A (3)	1.08	38	30	380	410.4	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 2A (4)	0.23	55	37	550	126.5	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 2A (5)	0.92	42	40	420	386.4	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 2A (6)	0.11	42	40	420	46.2	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 2A (7)	0.15	35	35	350	52.5	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 2A (8)	0.18	30	28	300	54	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 62 (1)	1.46	4	4	40	58.4	35	1.62	267.6	0.030	0.11	0.005	0.004	0.003	0.072
Route 62 (2)	1.64	15	27	270	442.8	35	1.62	267.6	0.030	0.11	0.005	0.004	0.003	0.072
Route 62 (3)	1.12	14	26	260	291.2	30	1.66	278.9	0.032	0.11	0.005	0.005	0.003	0.075
Route 4/225 (1)	2.1	0	0	0	0	35	1.62	267.6	0.030	0.11	0.005	0.004	0.003	0.072
Route 4/225 (2)	0.56	3	4	40	22.4	40	1.60	261.5	0.029	0.11	0.005	0.004	0.003	0.071
Route 4/225 (3)	0.16	0	0	0	0	25	1.76	308	0.036	0.11	0.006	0.005	0.003	0.083
South Road (1)	0.58	0	0	0	0	30	1.66	278.9	0.032	0.10	0.005	0.005	0.003	0.075
South Road (2)	0.85	4	5	50	42.5	30	1.66	278.9	0.032	0.10	0.005	0.005	0.003	0.075
Virginia Road	2.13	46	48	480	1022.4	30	1.66	278.9	0.032	0.10	0.005	0.005	0.003	0.075
Notes:														
1. AM and PM peak volumes are Hanscom Traffic only.														
2. ADT based on worst case AM or PM hours which represent approximately 10 percent of daily traffic.														
3. Vehicle emissions in kg/yr were based on daily emissions and scaled by 365 days.														
4. Total kg/1000 kg were divided by 1,000 for consistency with 2005 ESPR														

Table E-3: 2035 Mesoscale Analysis - Hanscom Field Traffic

Link	Distance (miles)	AM Peak	PM Peak	ADT	Daily VMT	Speed (mph)	Vehicle Emission Factors 2035 (g/mile)							
							CO	CO ₂	VOC	NO _x	PM ₁₀	PM _{2.5}	CH ₄	N ₂ O
Airport Road	0.32	0	0	0	0	30	0.91	218.959	0.020	0.042	0.003	0.003	0.002	0.052
Bedford Road	0.35	8	8	80	28	35	0.91	210.313	0.019	0.048	0.003	0.003	0.002	0.050
Concord Turnpike	0.6	30	19	300	180	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Hanscom Drive	0.65	104	90	1040	676	30	0.91	218.959	0.020	0.042	0.003	0.003	0.002	0.052
Hartwell Ave	1.24	13	11	130	161.2	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Hartwell Road	1.62	17	16	170	275.4	25	0.95	241.690	0.022	0.044	0.004	0.003	0.002	0.057
Mass Ave	0.36	7	9	90	32.4	35	0.91	210.313	0.019	0.048	0.003	0.003	0.002	0.050
Old Bedford Road 1	0.31	36	38	380	117.8	30	0.91	218.959	0.020	0.042	0.003	0.003	0.002	0.052
Old Bedford Road 2	0.49	14	2	140	68.6	30	0.91	218.959	0.020	0.042	0.003	0.003	0.002	0.052
Old Mass Ave	0.53	8	5	80	42.4	35	0.91	210.313	0.019	0.048	0.003	0.003	0.002	0.050
Route 2A (1)	0.46	37	28	370	170.2	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 2A (2)	1.67	16	16	160	267.2	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 2A (3)	1.08	46	35	460	496.8	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 2A (4)	0.23	54	43	540	124.2	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 2A (5)	0.92	50	47	500	460	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 2A (6)	0.11	50	47	500	55	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 2A (7)	0.15	42	42	420	63	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 2A (8)	0.18	35	33	350	63	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 62 (1)	1.46	5	7	70	102.2	35	0.92	210.313	0.019	0.048	0.003	0.003	0.002	0.050
Route 62 (2)	1.64	20	33	330	541.2	35	0.92	210.313	0.019	0.048	0.003	0.003	0.002	0.050
Route 62 (3)	1.12	18	29	290	324.8	30	0.905	218.959	0.020	0.042	0.003	0.003	0.002	0.052
Route 4/225 (1)	2.1	0	0	0	0	35	0.908	210.313	0.019	0.048	0.003	0.003	0.002	0.050
Route 4/225 (2)	0.56	3	5	50	28	40	0.92	205.635	0.019	0.053	0.003	0.003	0.002	0.048
Route 4/225 (3)	0.16	0	0	0	0	25	0.95	241.690	0.022	0.044	0.004	0.003	0.002	0.057
South Road (1)	0.58	0	0	0	0	30	0.91	218.959	0.020	0.042	0.003	0.003	0.002	0.052
South Road (2)	0.85	5	6	60	51	30	0.91	218.959	0.020	0.042	0.003	0.003	0.002	0.052
Virginia Road	2.13	47	59	590	1256.7	30	0.91	218.959	0.020	0.042	0.003	0.003	0.002	0.052

Notes:

1. AM and PM peak volumes are Hanscom Traffic only.
2. ADT based on worst case AM or PM hours which represent approximately 10 percent of daily traffic.
3. Vehicle emissions in kg/yr were based on daily emissions and scaled by 365 days.
4. Total kg/1000 kg were divided by 1,000 for consistency with 2005 ESPR

E.4 Greenhouse Gas (GHG) Emissions Inventory

The 2017 *ESPR* Scope Certificate requires the development of the first airport-wide GHG emissions inventory for Hanscom Field, to be used as a baseline to measure and compare future GHG emissions. This aligns with Massport's actions to prepare and update GHG emissions inventories for other facilities, including Logan Airport.

E.4.1 GHG Emissions Inventory Methodology

Airport GHG emissions are calculated in much the same way as criteria pollutants, through the use of input data such as activity levels or material throughput rates (i.e., fuel usage, VMT, electrical consumption) that are applied to appropriate emission factors (i.e., in units of GHG emissions per gallon of fuel). In this case, the input data were either based on Massport records, or data and information derived from the latest version of the FAA AEDT (AEDT 2.0d). Table E-5 summarizes the data and information used in the 2017 GHG inventory.

Table E-4 Hanscom Field GHG Inventory Input Data and Information for 2017

Source Description	Activity	Fuel Type	Value	Unit
Aircraft				
Tenant - Mobile	Aircraft – Ground (Taxi and Idle)	Jet A	640,978	gal
		AvGas	447,276	gal
	Aircraft - Ground to 3000 ft. (Mixing Height)	Jet A	794,953	gal
		AvGas	32,558	gal
	Aircraft - Total	Jet A	1,435,932	gal
		AvGas	479,834	gal
Aircraft Support Equipment				
Massport - Mobile	GSE	Propane Gas	158	gal
Tenant - Mobile	GSE	Propane Gas	100	gal
	GSE	Gasoline	10,528	gal
	GSE	Diesel	19,317	gal
Stationary - Boilers/Heaters/Generators				
Massport - Stationary	Boilers/Heaters	Fuel Oil #2	9,114	gal
	Boilers/Heaters	Natural Gas	1,747	MMBtu
Tenant - Stationary	Boilers/Heaters	Natural Gas	7,501	MMBtu
	Boilers/Heaters	Diesel	1,500	gal
	Emergency Generators	Diesel	100	gal
	Emergency Generators	Diesel	45	hours
Off-Airport Vehicle Use				
Massport - Mobile	Motor Vehicles - Employee Commute	Vehicle Miles Traveled	492,069	miles
Tenant - Mobile	Motor Vehicles - Employee Commute	Vehicle Miles Traveled	3,352,569	miles
Public	Motor Vehicles	Vehicle Miles Traveled	1,159,350	miles
Electrical Consumption				
Massport Electricity	Electricity Consumption		2,070,722	kWh
Tenant Electricity	Electricity Consumption		3,299,495	kWh

Emission factors were obtained from the U.S. Energy Information Administration, the Intergovernmental Panel on Climate Change (IPCC), EPA's MOVES, and the most recent version of EPA's GHG Emission Factors Hub (March 2018).^{29,30,31,32} Table E-6 presents emission factors for carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and carbon dioxide equivalent (CO₂e) for 2017.

²⁹ IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, 2006, www.ipccnggip.iges.or.jp/public/2006gl/index.html.

³⁰ U.S. Energy Information Administration, Voluntary Reporting of Greenhouse Gases Program. Fuel and Energy Source Codes and Emission Coefficients, www.eia.doe.gov/oiaf/1605/coefficients.html.

³¹ EPA, GHG Emissions Factors Hub (March 2018) <https://www.epa.gov/climateleadership/center-corporate-climateleadership-ghg-emission-factors-hub>. The most recent version of the Emission Factors Hub includes updates to emission factors for stationary and mobile combustion sources, new electricity emission factors from EPA's Emissions & Generation Resource Integrated Database (eGRID) and the IPCC Fifth Assessment Report (AR4/AR5)

³² U.S. Environmental Protection Agency, MOVES Emissions Model, <http://www.epa.gov/otaq/models/moves/>

Table E-5: GHG Emissions Factors for 2017

Sources	Fuel	CO ₂	N ₂ O	CH ₄	CO ₂ e	Unit
Aircraft	Jet A	21	0.00	0.00	21.67	lb/gallon
	AvGas	18	0.00	0.02	18.82	lb/gallon
Ground Support Equipment/ Auxiliary Power Units	Propane	13	0.00	0.00	12.65	lb/gallon
	Gasoline	19	0.00	0.00	19.56	lb/gallon
	Diesel	23	0.00	0.00	22.69	lb/gallon
Stationary/Portable	Natural Gas	146	0.00	0.00	146.38	lb/MMBtu
	Fuel Oil #2	23	0.00	0.00	22.75	lb/gallon
	Diesel - Generators by Hour	0	0.00	0.00	1.15	lb/hp-hour
	Diesel	23	0.00	0.00	22.69	lb/gallon
Motor Vehicles	Composite - Employee Commuting	343	0.01	0.02	346.45	g/mile
	Composite - Public Owned/ Controlled Roadway Use	354	0.10	0.00	381.38	g/mile
Electrical Consumption	Electricity	1	0.00	0.00	0.92	lb/kWh

Appendix F – Wetlands and Rare Species

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
<http://www.fws.gov/newengland>



In Reply Refer To:

June 15, 2018

Consultation Code: 05E1NE00-2018-SLI-2114

Event Code: 05E1NE00-2018-E-04895

Project Name: 2018 Hanscom AF Environmental Status and Planning Report

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2018-SLI-2114

Event Code: 05E1NE00-2018-E-04895

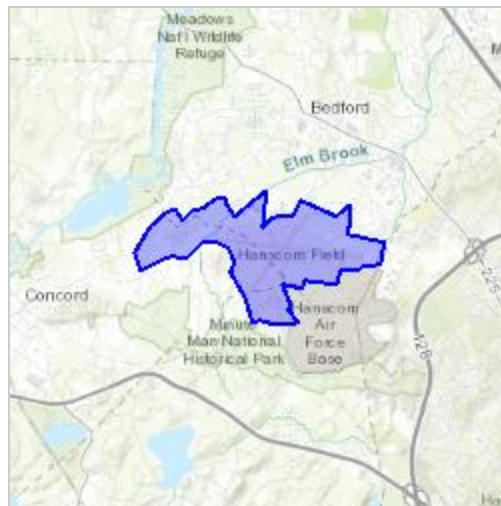
Project Name: 2018 Hanscom AF Environmental Status and Planning Report

Project Type: LAND - MANAGEMENT PLANS

Project Description: The Massachusetts Port Authority (Massport) is in the process of updating the 2012 L.G. Hanscom Field Environmental Status and Planning Report (2012 ESPR). Through the ESPR, Massport provides a status report on activity levels, environmental conditions, and provides data and analyses on noise, ground transportation, air quality, and water quality at Hanscom Field since 2012. The ESPR compares these conditions to historic data from the 2012 ESPR and evaluates the cumulative environmental effects of a moderate growth scenario for subsequent outyears (2020 and 2030). The ESPRs serve as an effective planning tool from which Massport's policy and program developments are derived. Fitzgerald & Halliday, Inc. (FHI) is part of the Harris Miller Miller & Hanson Inc. (HMMH) team engaged by Massport to prepare the 2018 Hanscom ESPR. FHI is requesting updated information since 2012 on known occurrences of Federal rare, endangered, threatened, or special status species at the Airfield.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/42.46889866706253N71.2837951176814W>



Counties: Middlesex, MA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

July 30, 2018

Lauren Glorioso
Natural Heritage and Endangered Species Program
Attn: Regulatory Review
Massachusetts Division of Fisheries and Wildlife
100 Hartwell St, Ste 230
West Boylston, MA 01583

Re: Request for MESA Information to support the 2018 Hanscom
Environmental Status and Planning Report

Dear Ms. Glorioso:

The Massachusetts Port Authority (Massport) is in the process of updating the 2012 *L.G. Hanscom Field Environmental Status and Planning Report* (2012 ESPR). Through the ESPR, Massport provides a status report on activity levels, environmental conditions, and provides data and analyses on noise, ground transportation, air quality, and water quality at Hanscom Field since 2012. The ESPR compares these conditions to historic data from the 2012 ESPR and evaluates the cumulative environmental effects of a moderate growth scenario for subsequent outyears (2020 and 2030). The ESPRs serve as an effective planning tool from which Massport's policy and program developments are derived.

Fitzgerald & Halliday, Inc. (FHI) is part of the Harris Miller Miller & Hanson Inc. (HMMH) team engaged by Massport to prepare the 2018 Hanscom ESPR. FHI is responsible for preparing information on wetlands, wildlife and waterways and for updating the information that was used in the 2012 ESPR documents. FHI is requesting from the Natural Heritage and Endangered Species Program updated information since 2012 on known occurrences of species designated by the Commonwealth of Massachusetts as rare, endangered, threatened, or other special status at the Project site (Figure 1).

We greatly appreciate your assistance in this matter. If you have any questions concerning this project, please feel free to contact me at (860) 321-9018.

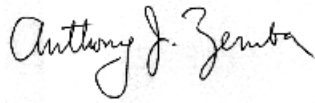
Lauren Glorioso

July 30, 2018

Page 2

Sincerely,

FHI

A handwritten signature in black ink that reads "Anthony J. Zemba". The signature is written in a cursive style with a horizontal line underneath it.

Anthony Zemba
Certified Ecologist / Soil Scientist

Attachment: Project Location Map and MESA Information Request Form

Cc: Mike Gove, Massport
Katherine Preston, HMMH

July 30, 2018

Mr. Thomas Chapman
U.S. Fish and Wildlife Service
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087

Re: Request for ESA Information to support the 2018 Hanscom
Environmental Status and Planning Report

Dear Mr. Chapman:

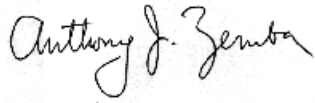
The Massachusetts Port Authority (Massport) is in the process of updating the 2012 *L.G. Hanscom Field Environmental Status and Planning Report* (2012 ESPR). Through the ESPR, Massport provides a status report on activity levels, environmental conditions, and provides data and analyses on noise, ground transportation, air quality, and water quality at Hanscom Field since 2012. The ESPR compares these conditions to historic data from the 2012 ESPR and evaluates the cumulative environmental effects of a moderate growth scenario for subsequent outyears (2020 and 2030). The ESPRs serve as an effective planning tool from which Massport's policy and program developments are derived.

Fitzgerald & Halliday, Inc. (FHI) is part of the Harris Miller Miller & Hanson Inc. (HMMH) team engaged by Massport to prepare the 2018 Hanscom ESPR. FHI is requesting updated information since 2012 on known occurrences of Federal rare, endangered, threatened, or special status species at the project site (Figure 1) including but not necessarily limited to species presented in the Information for Planning and Consultation (IPaC) report generated via the USFWS Environmental Conservation Online System (ECOS) by FHI for the site. A copy of the report is attached.

We greatly appreciate your assistance in this matter. If you have any questions concerning this project, please feel free to contact me at (860) 321-9018.

Sincerely,

FHI

A handwritten signature in black ink, reading "Anthony J. Zemba". The signature is written in a cursive style with a large, stylized "Z".

Anthony Zemba
Certified Ecologist / Soil Scientist

Attachments: Project Location Map
 IPAC Report

Cc: Mike Gove, Massport
 Katherine Preston, HMMH



DIVISION OF FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

MASSWILDLIFE

Request for State-listed Species Information

Please complete this form to request state-listed species information from the Natural Heritage & Endangered Species Program for a particular location (please submit only one project per form).

Fee: \$50.00, Payable to Comm. of MA – NHESP (as required in 321 CMR 10.17(3))

No fee required if request is for conservation purposes or habitat management and you are a non-profit conservation group, government agency or are working with a government agency.

Requestor Information

Name: Anthony Zemba

Affiliation: Fitzgerald & Halliday, Inc.

Address: 416 Asylum Street

City: Hartford

State: CT

Zip Code: 06103

Daytime Phone: (860) 321-9018 Ext.

Email address: Azemba@fhiplan.com

Project Information

Project or Site Name: L. G. Hanscom Field

Location: 200 Hanscom Dr. Ste 315

Town: Bedford, MA

Name of Landowner or Project Proponent (if different from Requestor): MassPort

Acreage of the Property: 1,300

Description of Proposed Project and Current Site Conditions: (If necessary attach additional sheet)

Please see attached sheet

Required: Enclose a map with the site location clearly marked and centered on the page.

Please **mail** this completed form, a topographic map, and fee (if applicable) to the above address, Attn: Regulatory Review.

If no fee is required, you can email the information to natural.heritage@state.ma.us.

A written response will be returned within 30 days of receipt of all information required.

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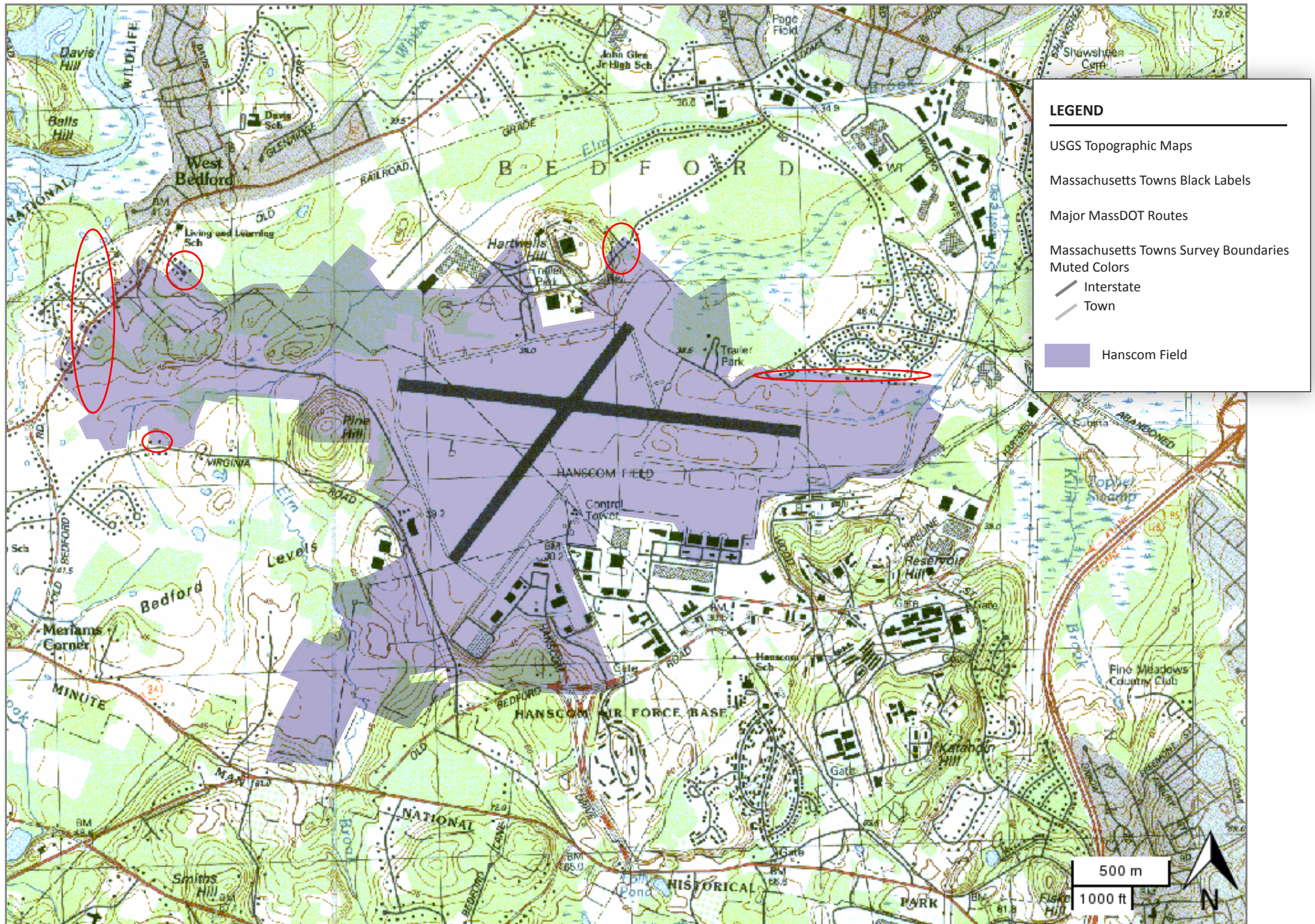
L.G. Hanscom Field Environmental Status and Planning Report Update (2018)

Project Description

The Massachusetts Port Authority (Massport) is in the process of updating the 2012 *L.G. Hanscom Field Environmental Status and Planning Report* (2012 ESPR). Through the ESPR, Massport provides a status report on activity levels, environmental conditions, and provides data and analyses on noise, ground transportation, air quality, and water quality at Hanscom Field since 2012. The ESPR compares these conditions to historic data from the 2012 ESPR and evaluates the cumulative environmental effects of a moderate growth scenario for subsequent outyears (2020 and 2030). The ESPRs serve as an effective planning tool from which Massport's policy and program developments are derived.

Fitzgerald & Halliday, Inc. (FHI) is part of the Harris Miller Miller & Hanson Inc. (HMMH) team engaged by Massport to prepare the 2018 Hanscom ESPR. FHI is requesting updated information since 2012 on known occurrences of state rare, endangered, threatened, or special status species at the project site (Figure 1).

Hanscom Topo Map





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DIVISION OF FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581

p: (508) 389-6300 | f: (508) 389-7890

MASS.GOV/MASSWILDLIFE

August 24, 2018

Anthony Zemba
Fitzgerald & Halliday, Inc
416 Asylum St.
Hartford CT 06103

RE: Project Location: Hanscom Field
Town: BEDFORD, CONCORD, LEXINGTON, LINCOLN
NHESP Tracking No.: 06-19316

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for information regarding state-listed rare species in the vicinity of the above referenced site. Based on the information provided, this project site, or a portion thereof, is located **within** *Priority Habitat 1128 and 1555* (PH 1128, PH 1555) and *Estimated Habitat 1623 and 1096* (EH 1623 & EH 1096) as indicated in the *Massachusetts Natural Heritage Atlas* (14th Edition) for the following state-listed rare species:

Priority Habitat 1128 (PH 1128) and Estimated Habitat 1623 (EH 1623):

<u>Scientific name</u>	<u>Common Name</u>	<u>Taxonomic Group</u>	<u>State Status</u>
<i>Emydoidea blandingii</i>	Blanding's Turtle	Reptile	Threatened

Priority Habitat 1555 (PH 1555) and Estimated Habitat 1096 (EH 1096):

<u>Scientific name</u>	<u>Common Name</u>	<u>Taxonomic Group</u>	<u>State Status</u>
<i>Glyptemys insculpta</i>	Wood Turtle	Reptile	Special Concern

Priority Habitat 1555 (PH 1555):

<u>Scientific name</u>	<u>Common Name</u>	<u>Taxonomic Group</u>	<u>State Status</u>
<i>Bartramia longicauda</i>	Upland Sandpiper	Bird	Endangered
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Bird	Threatened

The species listed above are protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (WPA) (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.00). Fact sheets for most state-listed rare species can be found on our website (www.mass.gov/nhesp).

Please note that projects and activities located within Priority and/or Estimated Habitat must be reviewed by the Division for compliance with the state-listed rare species protection provisions of MESA (321 CMR 10.00) and/or the WPA (310 CMR 10.00).

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Wetlands Protection Act (WPA)

If the project site is within Estimated Habitat and a Notice of Intent (NOI) is required, then a copy of the NOI must be submitted to the Division so that it is received at the same time as the local conservation commission. If the Division determines that the proposed project will adversely affect the actual Resource Area habitat of state-protected wildlife, then the proposed project may not be permitted (310 CMR 10.37, 10.58(4)(b) & 10.59). In such a case, the project proponent may request a consultation with the Division to discuss potential project design modifications that would avoid adverse effects to rare wildlife habitat.

A streamlined joint MESA/WPA review process is available. When filing a Notice of Intent (NOI), the applicant may file concurrently under the MESA on the same NOI form and qualify for a 30-day streamlined joint review. For a copy of the NOI form, please visit the MA Department of Environmental Protection's website: <https://www.mass.gov/how-to/wpa-form-3-wetlands-notice-of-intent>.

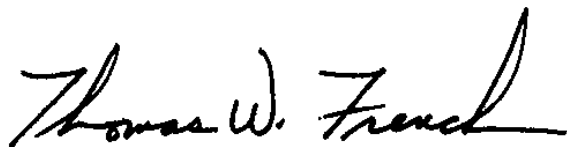
MA Endangered Species Act (MESA)

If the proposed project is located within Priority Habitat and is not exempt from review (see 321 CMR 10.14), then project plans, a fee, and other required materials must be sent to Natural Heritage Regulatory Review to determine whether a probable Take under the MA Endangered Species Act would occur (321 CMR 10.18). Please note that all proposed and anticipated development must be disclosed, as MESA does not allow project segmentation (321 CMR 10.16). For a MESA filing checklist and additional information please see our website: <https://www.mass.gov/regulatory-review>.

We recommend that rare species habitat concerns be addressed during the project design phase prior to submission of a formal MESA filing, as avoidance and minimization of impacts to rare species and their habitats is likely to expedite endangered species regulatory review.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. If the purpose of your inquiry is to generate a species list to fulfill the federal Endangered Species Act (16 U.S.C. 1531 et seq.) information requirements for a permit, proposal, or authorization of any kind from a federal agency, we recommend that you contact the National Marine Fisheries Service at (978)281-9328 and use the U.S. Fish and Wildlife Service's Information for Planning and Conservation website (<https://ecos.fws.gov/ipac>). If you have any questions regarding this letter please contact Lauren Glorioso, Endangered Species Review Assistant, at (508) 389-6361.

Sincerely,



Thomas W. French, Ph.D.
Assistant Director

Appendix G — Cultural and Historical Resources

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Table G-1 Historic Architectural Resources located at Traffic Study Intersections, 2017

Inter-section No.	Town	Intersection	Historic Resource Name (Designation) ¹
1	Lexington	Route 4/225 (Great Rd)/Hartwell Ave	No historic resources identified
2	Lexington	Route 2A (Marrett Rd)/Mass Ave	Minute Man National Historical Park (MMNHP) (NHL, NR)
3	Lexington	Route 2A (Mass Ave)/Old Mass Ave	Minute Man National Historical Park (NHL, NR) LEX.929 Bluff Monument (MMNHP)
4	Lexington	Route 2A (Mass Ave)/Airport Rd (Marrett St)	Minute Man National Historical Park (NHL, NR) LEX.932 Whittemore-Muzzey Stone Walls (MMNHP)
5	Lincoln	Hanscom Drive/Old Bedford Rd	No historic resources identified
6	Lincoln	Route 2A (North Great Rd)/Hanscom Dr	Minute Man National Historical Park (NHL, NR)
7	Concord	Lexington Rd/Old Bedford Rd	Minute Man National Historical Park (NHL, NR) CON.BL Lower Old Bedford Rd/Virginia Road Area (MACRIS) CON.175 Deacon Sampson Mason-Terrence McHugh House (MMNHP/CON-BL) CON.349 Daniel Taylor House (MMNHP/CON.BL) CON.9020 Taylor Retaining Wall (MMNHP/CON.DS) CON.9012 Meriam's Corner Stone Walls (MMNHP/CON.DS) CON.9015 Meriam's Corner Monument (MMNHP/CON.DS)
8	Concord	Old Bedford Rd/Virginia Rd	CON.BL Lower Old Bedford Rd/Virginia Road Area (MACRIS) CON.1068 Frank Peterson House (CON.BL) CON.1069 Patrick Dalton House (CON.BL)
9	Bedford	Route 62 (Concord Rd)/Hartwell Rd	BED.H Concord Road Area (MACRIS) BED.342 230 Concord Road (MACRIS) BED.344 247-249 Concord Road House (MACRIS) 231 Concord Road (MACRIS, unassigned)
10	Bedford	South Rd/Hartwell Rd	BED.928 Hartwell Town Forest Horse Trough Memorial (MACRIS)

Note 1. MMNHP – Minute Man National Historical Park; NHL – National Historic Landmark, NR – National Register of Historic Places

All Historic Resources listed in the National and State Registers, and in the Inventory and MACRIS in Bedford, reconnaissance survey area (projected 2035 55 dB DNL high growth noise contour or within 200 feet from a traffic study intersection), 2017.

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
Bedford									
BED.H	Concord Road Area	Concord Rd	N/A	Multiple		P	P	P	
BED.O	South Road - Tilden Street	South Rd, Tilden St	N/A	Multiple		✓	✓	✓	
BED.359	BED.H Concord Road Area	435 Concord Rd	N/A	1947		✓	✓	✓	
BED.1	BED.H Concord Road Area	445 Concord Rd	Richard Wheeler House	1695		✓	✓	✓	
BED.927	N/A	Hartwell Rd	Hartwell Town Forest	1940		P	P	✓	
BED.928	N/A	Hartwell Rd	Hartwell Town Forest Horse Trough Memorial	1820		✓	✓	✓	
BED.553	N/A	South Rd	Base Picnic Area Services Building #1003	1952		✓	✓	✓	
BED.184	N/A	330 South Rd	Clark Farm	1905		✓	✓	✓	
BED.492	N/A	330 South Rd	Clark Farm Barn	ca. 1905		✓	✓	✓	
BED.493	N/A	330 South Rd	Clark Farm- Out Building	ca. 1905		✓	✓	✓	
BED.494	N/A	330 South Rd	Clark Farm- Out Building	ca. 1905		✓	✓	✓	
BED.495	N/A	330 South Rd	Clark Farm- Out Building	ca. 1905		✓	✓	✓	
BED.185	N/A	345 South Rd	Peter Kelley House	1855		✓	✓	✓	
BED.444	BED.O South Road - Tilden Street Area	394 South Rd	N/A	1930		✓	✓	✓	
BED.445	BED.O South Road - Tilden Street Area	398 South Rd	N/A	1930		✓	✓	✓	
BED.446	BED.O South Road - Tilden Street Area	5 Tilden St	N/A	1930		✓	✓	✓	

Notes

1. Historic district or area. Noise Analysis Location number is indicated in brackets where applicable. N/A indicates properties that are not located within a historic district or area.
2. N/A indicates districts, areas, or properties that are only identified by address. Noise analysis location number is indicated in brackets where applicable.
3. National Register of Historic Places (NR), State Register of Historic Places (LHD or SR), National Historic Landmark (NHL).
4. Area/property is partially (P) or completely (✓) within the 2017, 2025, or 2035 55 dB DNL contours. All historic resources listed are outside the 2017, 2025, and 2035 65 dB DNL contours.
5. Intersection that is located within 200 feet from historic district, area, or property.

G-3

All Historic Resources listed in the National and State Registers, and in the Inventory and MACRIS in Concord, reconnaissance survey area (projected 2035 55 dB DNL high growth noise contour or within 200 feet from a traffic study area intersection), 2017.

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
CON.BO	Bedford Street Area II	Bedford St	N/A	Multiple		✓	✓	✓	
CON.BK	Lexington Road – Shadyside Avenue Area	Lexington Rd, Shadyside Ave	N/A	Multiple		P	P	P	None
CON.BL	Lower Old Bedford – Virginia Roads Area	Old Bedford Rd, Virginia Rd	N/A	Multiple		P	P	P	TSA 7: Old Bedford Road & Lexington Road (Route 2A) TSA 8: Old Bedford Road & Virginia Road
CON.C	Minute Man National Historical Park	Route 2A	N/A	Multiple	NR/SR NHL				TSA 7: Old Bedford Road & Lexington Road (Route 2A)
CON.EC	Minute Man National Historical Park	Route 2A	N/A	Multiple	NR NHL				TSA 7: Old Bedford Road & Lexington Road (Route 2A)
CON.BM	Old Bedford Road Area	Old Bedford Rd	N/A	Multiple		✓	✓	✓	
CON.BN	Old Bedford Road Area II	Old Bedford Rd	N/A	Multiple		✓	✓	✓	
CON.BZ	Barrett-Hutchins Farm	Monument St	N/A	Multiple				✓	
CON.1081	CON.BO Bedford Street Area II	643 Bedford St	N/A	1875				✓	
CON.1082	CON.BO Bedford Street Area II	649 Bedford St	N/A	1875				✓	
CON.1083	CON.BO Bedford Street Area II	668 Bedford St	N/A	1895				✓	
CON.1085	CON.BO Bedford Street Area II	689 Bedford St	N/A	1930				✓	
CON.1086	CON.BO Bedford Street Area II	701 Bedford St	N/A	1920				✓	
CON.1088	CON.BO Bedford Street Area II	715 Bedford St	N/A	1880				✓	
CON.1089	CON.BO Bedford Street Area II	737 Bedford St	N/A	1870				✓	
CON.1090	CON.BO Bedford Street Area II	759 Bedford St	N/A	1920				✓	
CON.9012		Lexington Rd	Meriam's Corner Stone Walls	1885					TSA 7: Old Bedford Road & Lexington Road (Route 2A)
CON.9015		Lexington Rd	Meriam's Corner Monument	1885					TSA 7: Old Bedford Road & Lexington Road (Route 2A)
CON.175	CON.DS American Mile Historic District	645 Lexington Rd	Dea. Sampson Mason -	1850	LHD/SR NR				TSA 7: Old Bedford Road & Lexington Road

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
			Terrence McHugh House		NHL				(Route 2A)
CON.349	CON.C/CON.EC Minute Man National Historical Park CON.DS American Mile Historic District	663 Lexington Rd	Daniel Taylor House	1804	LHD/SR NR NHL				TSA 7: Old Bedford Road & Lexington Road (Route 2A)
CON.9020	CON.C/CON.EC Minute Man National Historical Park CON.DS American Mile Historic District	663 Lexington Rd	Daniel Taylor Retaining Wall	1810	LHD/SR NR NHL				TSA 7: Old Bedford Road & Lexington Road (Route 2A)
CON.1831		1133 Lexington Rd	Walter Beateay House	1945	NR NHL			✓	
CON.358	CON.C/CON.EC Minute Man National Historical Park	1175 Lexington Rd	Samuel Brooks House	1733	NR NHL				
CON.930	N/A	Old Bedford Rd	Concord - Bedford Boundary Marker	1903		✓	✓	✓	
CON.1068	CON.BL Lower Old Bedford - Virginia Roads Area	250 Old Bedford Rd	Frank Peterson House	1910				✓	
CON.1069	CON.BL Lower Old Bedford - Virginia Roads Area	275-277 Old Bedford Rd	Patrick Dalton House	1880				✓	TSA 8: Old Bedford Road & Virginia Road
CON.1070	CON.BL Lower Old Bedford - Virginia Roads Area	389 Old Bedford Rd	Daniel McManus House	1905		✓	✓	✓	
CON.179	N/A	430 Old Bedford Rd	Waldo Flint House	1890		✓	✓	✓	
CON.180	N/A	472-474 Old Bedford Rd	Benoni and Thomas Fox House	1711		✓	✓	✓	
CON.181	N/A	505 Old Bedford Rd	Samuel Fox House	1702		✓	✓	✓	
CON.1077	CON.BN Old Bedford Road Area II	527 Old Bedford Rd	N/A	1915		✓	✓	✓	
CON.1078	CON.BN Old Bedford Road Area II	537 Old Bedford Rd	N/A	1915		✓	✓	✓	
CON.1079	CON.BN Old Bedford Road Area II	547 Old Bedford Rd	Theodore Barry House	1870		✓	✓	✓	
CON.182		550 Old Bedford Rd	Enos Fox House	1770		✓	✓	✓	
CON.1080	CON.BN Old Bedford Road Area II	595 Old Bedford Rd	Theodore Barry House	1900		✓	✓	✓	
CON.1073	CON.BM Old Bedford Road Area	643 Old Bedford Rd	N/A	1920		✓	✓	✓	
CON.1074	CON.BM Old Bedford Road Area	654 Old Bedford Rd	Sennott House	1875		✓	✓	✓	
CON.1075	CON.BM Old Bedford Road Area	667 Old Bedford Rd	N/A	1920		✓	✓	✓	
CON.1071	CON.BL Lower Old Bedford - Virginia	74 Virginia Rd	N/A	1925		✓	✓	✓	

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
	Roads Area								
CON.1072	CON.BL Lower Old Bedford - Virginia Roads Area	88 Virginia Rd	J. W. Kenney House	1925		✓	✓	✓	
CON.176	N/A	215-217 Virginia Rd	William Tibbets House - Thoreau Farm	1878		✓	✓	✓	
CON.177	N/A	341 Virginia Rd	Dea. John Wheeler - Capt. Jonas Minot Farmhouse [NC-18]	1730	NR	✓	✓	✓	
CON.178	N/A	477 Virginia Rd	Wheeler - Merriam House [NC-19]	1692	NR	✓	✓	✓	

- Notes**
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 2. N/A indicates districts, areas, or properties that are only identified by address. Noise analysis location number is indicated in brackets where applicable.
 3. National Register of Historic Places (NR), State Register of Historic Places (LHD or SR), National Historic Landmark (NHL).
 4. Area/property is partially (P) or completely (✓) within the 2017, 2025, or 2035 55 dB DNL contours. All historic resources listed are outside the 2017, 2025, and 2035 65 dB DNL contours.
 5. Intersection that is located within 200 feet from historic district, area, or property.

All Historic Resources listed in the National and State Registers, and in the Inventory and MACRIS in Lexington, reconnaissance survey area (projected 2035 55 dB DNL high growth noise contour or within 200 feet from a traffic study area intersection), 2017.

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
LEX.AJ	Lexington Heights - Meagherville	Avon St, Center St, Earl St, Garfield St, Myrtle St, Reed St, Valley Rd	N/A	Multiple		✓	✓	✓	
LEX.AU	Lexington Manor	Bedford St, Harding Rd, Gleason Rd, Dexter Rd, Bertwell Rd, Williams Rd, Simonds Rd, Fuller Rd, Eaton Rd, Blake Rd, Nichols Rd, Preston Rd	N/A	Multiple		✓	✓	✓	
LEX.929	LEX.AQ Minute Man National Historic Park	Old Massachusetts Ave and Marrett Rd	Bluff Monument		NHL				TSA 3: Old Mass Ave, Mass Ave, & Marrett Rd
LEX.932	LEX.AQ Minute Man National Historic Park	Massachusetts Ave and Marrett St	Whittemore - Muzzey Stone Walls	18th century	NHL				TSA 4: Mass Ave & Marrett St
LEX.913	N/A	Route 128	Boston and Maine Railroad Bridge over Route 128	1961		✓	✓	✓	
LEX.789	LEX.AJ Lexington Heights - Meagherville	12 Avon St	N/A	1906		✓	✓	✓	
LEX.1652	LEX.AU Lexington Manor	289 Bedford St		1940		✓		✓	
LEX.1653	LEX.AU Lexington Manor	293 Bedford St		1920		✓	✓	✓	
LEX.776	N/A	297 Bedford St	Nathan Reed - James Parker House	1835				✓	
LEX.777	N/A	297 Bedford St	Reed-Parker House Out Building	ca. 1835				✓	
LEX.1654	LEX.AU Lexington Manor	301 Bedford St		1927		✓	✓	✓	
LEX.1655	LEX.AU Lexington Manor	305 Bedford St		1926		✓	✓	✓	
LEX.1656	LEX.AU Lexington Manor	307 Bedford St		1930		✓	✓	✓	
LEX.1657	LEX.AU Lexington Manor	311 Bedford St		1920		✓	✓	✓	

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
LEX.1028	N/A	315 Bedford St	Basil Hawkins House	1924				✓	
LEX.1658	LEX.AU Lexington Manor	321 Bedford St		1921		✓	✓	✓	
LEX.1659	LEX.AU Lexington Manor	323 Bedford St		1930			✓	✓	
LEX.1660	LEX.AU Lexington Manor	325 Bedford St		1929			✓	✓	
LEX.778	N/A	330 Bedford St	Capt. Christopher Reed House #1	1818				✓	
LEX.413	N/A	331 Bedford St	Simonds Tavern [NLX-1]	1795	NR			✓	
LEX.779	N/A	342 Bedford St	Christopher Reed House #2	1825				✓	
LEX.780	N/A	342 Bedford St	Christopher Reed Barn	ca. 1825				✓	
LEX.1674	LEX.AU Lexington Manor	42 Bertwell Rd		1924				✓	
LEX.1675	LEX.AU Lexington Manor	43 Bertwell Rd		1929			✓	✓	
LEX.1676	LEX.AU Lexington Manor	44 Bertwell Rd		1928			✓	✓	
LEX.1677	LEX.AU Lexington Manor	51 Bertwell Rd		1924			✓	✓	
LEX.1855	LEX.AU Lexington Manor	55 Bertwell Rd		1950		✓	✓	✓	
LEX.1856	LEX.AU Lexington Manor	60 Bertwell Rd		1947		✓	✓	✓	
LEX.1857	LEX.AU Lexington Manor	64 Bertwell Rd		1953		✓	✓	✓	
LEX.1678	LEX.AU Lexington Manor	65 Bertwell Rd		1920			✓	✓	
LEX.1858	LEX.AU Lexington Manor	68 Bertwell Rd		1951		✓	✓	✓	
LEX.1859	LEX.AU Lexington Manor	72 Bertwell Rd		1952			✓	✓	
LEX.1679	LEX.AU Lexington Manor	69 Bertwell Rd		1924			✓	✓	
LEX.1680	LEX.AU Lexington Manor	75 Bertwell Rd		1926			✓	✓	
LEX.1681	LEX.AU Lexington Manor	76 Bertwell Rd		1941			✓	✓	
LEX.1860	LEX.AU Lexington Manor	79 Bertwell Rd		1960				✓	
LEX.1682	LEX.AU Lexington Manor	78 Bertwell Rd		1940			✓	✓	
LEX.1684	LEX.AU Lexington Manor	84 Bertwell Rd		1938				✓	
LEX.1863	LEX.AU Lexington Manor	39 Blake Rd		1950				✓	
LEX.1864	LEX.AU Lexington Manor	40 Blake Rd		1984				✓	
LEX.1689	LEX.AU Lexington Manor	48 Blake Rd		1941			✓	✓	
LEX.1690	LEX.AU Lexington Manor	51 Blake Rd		1941			✓	✓	

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
LEX.1865	LEX.AU Lexington Manor	54 Blake Rd		1948			✓	✓	
LEX.1691	LEX.AU Lexington Manor	57 Blake Rd		1941			✓	✓	
LEX.1866	LEX.AU Lexington Manor	58 Blake Rd		1948			✓	✓	
LEX.1867	LEX.AU Lexington Manor	60 Blake Rd		1947			✓	✓	
LEX.1868	LEX.AU Lexington Manor	65 Blake Rd		1943				✓	
LEX.1869	LEX.AU Lexington Manor	66 Blake Rd		1943			✓	✓	
LEX.1870	LEX.AU Lexington Manor	70 Blake Rd		1981				✓	
LEX.1692	LEX.AU Lexington Manor	73 Blake Rd		1940				✓	
LEX.790	LEX.AJ Lexington Heights - Meagherville	33 Center St	N/A	1906				✓	
LEX.1701	LEX.AU Lexington Manor	6 Dexter Rd		1935		✓	✓	✓	
LEX.1047	N/A	7 Dexter Rd	Albert W. Emmons House	1926				✓	
LEX.1702	LEX.AU Lexington Manor	10 Dexter Rd		1933		✓	✓	✓	
LEX.1703	LEX.AU Lexington Manor	11 Dexter Rd		1925		✓	✓	✓	
LEX.1704	LEX.AU Lexington Manor	14 Dexter Rd		1931		✓	✓	✓	
LEX.1705	LEX.AU Lexington Manor	15 Dexter Rd		1924		✓	✓	✓	
LEX.1706	LEX.AU Lexington Manor	18 Dexter Rd		1940		✓	✓	✓	
LEX.1707	LEX.AU Lexington Manor	19 Dexter Rd		1923			✓	✓	
LEX.1708	LEX.AU Lexington Manor	22 Dexter Rd		1928		✓	✓	✓	
LEX.1709	LEX.AU Lexington Manor	23 Dexter Rd		1927			✓	✓	
LEX.1880	LEX.AU Lexington Manor	28 Dexter Rd		1948			✓	✓	
LEX.1881	LEX.AU Lexington Manor	29 Dexter Rd		1949			✓	✓	
LEX.1882	LEX.AU Lexington Manor	30 Dexter Rd		1962			✓	✓	
LEX.1710	LEX.AU Lexington Manor	33 Dexter Rd		1920			✓	✓	
LEX.1711	LEX.AU Lexington Manor	35 Dexter Rd		1931				✓	
LEX.1883	LEX.AU Lexington Manor	38 Dexter Rd		1968			✓	✓	
LEX.1899	LEX.AU Lexington Manor	5 Fuller Rd		1943				✓	
LEX.1728	LEX.AU Lexington Manor	9 Fuller Rd		1933				✓	
LEX.1729	LEX.AU Lexington Manor	17 Fuller Rd		1940			✓	✓	
LEX.1730	LEX.AU Lexington Manor	25 Fuller Rd		1941			✓	✓	
LEX.1900	LEX.AU Lexington Manor	30 Fuller Rd		1949			✓	✓	

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
LEX.1901	LEX.AU Lexington Manor	31 Fuller Rd		1946			✓	✓	
LEX.1902	LEX.AU Lexington Manor	36 Fuller Rd		1947			✓	✓	
LEX.1910	LEX.AU Lexington Manor	31 Gleason Rd		1950				✓	
LEX.1911	LEX.AU Lexington Manor	34 Gleason Rd		1956				✓	
LEX.1732	LEX.AU Lexington Manor	43 Gleason Rd		1930			✓	✓	
LEX.1733	LEX.AU Lexington Manor	46 Gleason Rd		1936			✓	✓	
LEX.1912	LEX.AU Lexington Manor	47 Gleason Rd		1946		✓	✓	✓	
LEX.1734	LEX.AU Lexington Manor	50 Gleason Rd		1935		✓	✓	✓	
LEX.1735	LEX.AU Lexington Manor	51 Gleason Rd		1940		✓	✓	✓	
LEX.1736	LEX.AU Lexington Manor	52 Gleason Rd		1935		✓	✓	✓	
LEX.1737	LEX.AU Lexington Manor	54 Gleason Rd		1930		✓	✓	✓	
LEX.1738	LEX.AU Lexington Manor	55 Gleason Rd		1970		✓	✓	✓	
LEX.1739	LEX.AU Lexington Manor	57 Gleason Rd		1937		✓	✓	✓	
LEX.1740	LEX.AU Lexington Manor	59 Gleason Rd		1939		✓	✓	✓	
LEX.1741	LEX.AU Lexington Manor	60 Gleason Rd		1942		✓	✓	✓	
LEX.1913	LEX.AU Lexington Manor	62 Gleason Rd		1954		✓	✓	✓	
LEX.1742	LEX.AU Lexington Manor	63 Gleason Rd		1920		✓	✓	✓	
LEX.1743	LEX.AU Lexington Manor	65 Gleason Rd		1928		✓	✓	✓	
LEX.1744	LEX.AU Lexington Manor	67 Gleason Rd		1936			✓	✓	
LEX.1745	LEX.AU Lexington Manor	68 Gleason Rd		1936		✓	✓	✓	
LEX.1914	LEX.AU Lexington Manor	70 Gleason Rd		1950			✓	✓	
LEX.1746	LEX.AU Lexington Manor	81 Gleason Rd		1928				✓	
LEX.1915	LEX.AU Lexington Manor	82 Gleason Rd		1952			✓	✓	
LEX.1747	LEX.AU Lexington Manor	84 Gleason Rd		1934				✓	
LEX.1749	LEX.AU Lexington Manor	86 Gleason Rd		1935				✓	
LEX.1759	LEX.AU Lexington Manor	20 Harding Rd		1940				✓	
LEX.1760	LEX.AU Lexington Manor	25 Harding Rd		1923			✓	✓	
LEX.1761	LEX.AU Lexington Manor	27 Harding Rd		1926			✓	✓	
LEX.1762	LEX.AU Lexington Manor	28 Harding Rd		1930			✓	✓	
LEX.1763	LEX.AU Lexington Manor	29 Harding Rd		1940		✓	✓	✓	
LEX.1764	LEX.AU Lexington Manor	30 Harding Rd		1929			✓	✓	

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
LEX.1765	LEX.AU Lexington Manor	31 Harding Rd		1940		✓	✓	✓	
LEX.1766	LEX.AU Lexington Manor	35 Harding Rd		1927		✓	✓	✓	
LEX.1767	LEX.AU Lexington Manor	37 Harding Rd		1920		✓	✓	✓	
LEX.1768	LEX.AU Lexington Manor	40 Harding Rd		1931		✓	✓	✓	
LEX.1769	LEX.AU Lexington Manor	41 Harding Rd		1926		✓	✓	✓	
LEX.1923	LEX.AU Lexington Manor	42 Harding Rd		1973		✓	✓	✓	
LEX.1924	LEX.AU Lexington Manor	43 Harding Rd		1965		✓	✓	✓	
LEX.1925	LEX.AU Lexington Manor	44 Harding Rd		1966		✓	✓	✓	
LEX.1770	LEX.AU Lexington Manor	45 Harding Rd		1925		✓	✓	✓	
LEX.1061	N/A	46 Harding Rd	John Andersen House	1925				✓	
LEX.1062	N/A	46 Harding Rd	John Andersen Garage	1931				✓	
LEX.1771	LEX.AU Lexington Manor	47 Harding Rd		1929		✓	✓	✓	
LEX.1772	LEX.AU Lexington Manor	48 Harding Rd		1930		✓	✓	✓	
LEX.1773	LEX.AU Lexington Manor	51 Harding Rd		1921			✓	✓	
LEX.1926	LEX.AU Lexington Manor	52 Harding Rd		1951		✓	✓	✓	
LEX.1774	LEX.AU Lexington Manor	53 Harding Rd		1931			✓	✓	
LEX.1775	LEX.AU Lexington Manor	54 Harding Rd		1930			✓	✓	
LEX.1776	LEX.AU Lexington Manor	55 Harding Rd		1936				✓	
LEX.1777	LEX.AU Lexington Manor	56 Harding Rd		1946			✓	✓	
LEX.1778	LEX.AU Lexington Manor	57 Harding Rd		1940				✓	
LEX.1927	LEX.AU Lexington Manor	58 Harding Rd		1947			✓	✓	
LEX.1779	LEX.AU Lexington Manor	60 Harding Rd		1927				✓	
LEX.1780	LEX.AU Lexington Manor	62 Harding Rd		1927				✓	
LEX.1786	LEX.AU Lexington Manor	7 Preston Rd		1926				✓	
LEX.1949	LEX.AU Lexington Manor	10 Preston Rd		1952				✓	
LEX.1950	LEX.AU Lexington Manor	11 Preston Rd		1949				✓	
LEX.1951	LEX.AU Lexington Manor	15 Preston Rd		1953			✓	✓	
LEX.1952	LEX.AU Lexington Manor	17 Preston Rd		1952			✓	✓	
LEX.1953	LEX.AU Lexington Manor	18 Preston Rd		1955				✓	
LEX.1954	LEX.AU Lexington Manor	21 Preston Rd		1950			✓	✓	

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
LEX.1955	LEX.AU Lexington Manor	24 Preston Rd		1945				✓	
LEX.1956	LEX.AU Lexington Manor	25 Preston Rd		1951				✓	
LEX.1862	LEX.AU Lexington Manor	41 Preston Rd		1949				✓	
LEX.785	LEX.AJ Lexington Heights - Meagherville	153 Reed St	N/A	1906			✓	✓	
LEX.786	LEX.AJ Lexington Heights - Meagherville	159 Reed St	N/A	1906		✓	✓	✓	
LEX.1790	LEX.AU Lexington Manor	31 Simonds Rd		1921			✓	✓	
LEX.1791	LEX.AU Lexington Manor	32 Simonds Rd		1940			✓	✓	
LEX.1792	LEX.AU Lexington Manor	55 Simonds Rd		1941				✓	
LEX.1011	LEX.AJ Lexington Heights - Meagherville	34 Valley Rd	N/A	1875				✓	
LEX.1012	LEX.AJ Lexington Heights - Meagherville	48 Valley Rd	N/A	1906		✓	✓	✓	
LEX.1013	LEX.AJ Lexington Heights - Meagherville	62 Valley Rd	N/A	1906		✓	✓	✓	
LEX.1014	LEX.AJ Lexington Heights - Meagherville	67 Valley Rd	N/A	1906		✓	✓	✓	

- Notes**
1. Historic district or area. Noise Analysis Location number is indicated in brackets where applicable. N/A indicates properties that are not located within a historic district or area.
 2. N/A indicates districts, areas, or properties that are only identified by address. Noise analysis location number is indicated in brackets where applicable.
 3. National Register of Historic Places (NR), State Register of Historic Places (LHD or SR), National Historic Landmark (NHL).
 4. Area/property is partially (P) or completely (✓) within the 2017, 2025, or 2035 55 dB DNL contours. All historic resources listed are outside the 2017, 2025, and 2035 65 dB DNL contours.
 5. Intersection that is located within 200 feet from historic district, area, or property.

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All Historic Resources listed in the National and State Registers, and in the Inventory and MACRIS in Lincoln, reconnaissance survey area (projected 2035 55 dB DNL high growth noise contour or within 200 feet from a traffic study area intersection), 2017.

MHC Number	Historic Area/District ¹	Street Address	Historic Property ²	Date	National Register /State Register Status ³	55 dB DNL Contour ⁴			Intersection ⁵
						2017	2025	2035	
LIN.F	Minute Man National Historical Park	Route 2A	N/A	Multiple	NR NHL				TSA 6: Hanscom Drive & Route 2A
LIN.G	Minute Man National Historical Park	Route 2A	N/A	Multiple	NR NHL	P	P	P	TSA 6: Hanscom Drive & Route 2A

Notes

1. Historic district or area. Noise Analysis Location number is indicated in brackets where applicable. N/A indicates properties that are not located within a historic district or area.
2. N/A indicates districts, areas, or properties that are only identified by address. Noise analysis location number is indicated in brackets where applicable.
3. National Register of Historic Places (NR), State Register of Historic Places (LHD or SR), National Historic Landmark (NHL).
4. Area/property is partially (P) or completely (✓) within the 2017, 2025, or 2035 55 dB DNL contours. All historic resources listed are outside the 2017, 2025, and 2035 65 dB DNL contours.
5. Intersection that is located within 200 feet from historic district, area, or property.

Table G-6 Fifty Year Old Properties Surveyed in Hanscom Field, 2017

Town	Building Number	Building Name ¹	Date
Bedford	1	Hangar 1 - Signature Flight Services	1955
Bedford	2	Hangar 2 - Signature Flight Services	1955
Bedford	3	Hangar 3 - Signature Flight Services	1955
Concord	25	MIT Draper Laboratory Centrifuge Building	1948
Lincoln	10	Hangar 10 – Signature Flight Services	1950s
Lincoln	15	Civil Air Terminal	1953
Lincoln	20	Maintenance Building	1954

Notes: 1. Buildings 12A, 16, and 17 have been demolished since 2012.

Table G-7 Fifty Year Old Properties at Hanscom Air Force Base, 2017

Town	Building Number ¹	Area Name ²	Street Address	NR Status ²
Bedford	1614	Administrative Complex	11 Barksdale Street	
	1639	Base Center	97 Barksdale Street	
	1723	Hangars	25 Chennault Street	
	1728	Hangars	29 Chennault Street	
	1729	Hangars	51 Chennault Street	
	1642	Base Center	70 Chennault Street	
	1825	Civil Engineering	72 Dow Street	
	1716	Hangars	115 Eglin Street	
	1917	Civil Engineering	Grenier Street	
	1646	Base Center	81 Grenier Street	
	1813	Civil Engineering	119 Grenier Street	
	1809/1810	Civil Engineering	120-131 Grenier Street	
	1843	Civil Engineering	141 Grenier Street	
	1425	Hospitality	60 Kirtland Street	
	1427	Hospitality	75 Kirtland Street	
	1426	Hospitality	85 Kirtland Street	
Lexington	1302 D	Lincoln Labs	71 Schilling Circle	
	1302 E	Lincoln Labs	75 Schilling Circle	
	1302 F	Lincoln Labs	51 Shilling Circle	
	Multiple	Air Force Cambridge Research Laboratory Historic District	Randolph Road, Grenier Street, Wright Street	National Register Eligible
Lincoln	1712	Hangars	6 Chennault Street	
	1710	Hangars	9 Chennault Street	
	1610	Administrative Complex	111 Eglin Street	

Notes: 1. N/A – Not Applicable

2. AFCRL Historic District was determined eligible (NRDOE) for National Register listing by the USAF and SHPO in 2012. It is in the Hanscom ESPR 2017 General Study Area but is outside the 2035 55 DNL noise contour.

Table G-8 *Fifty Year Old Properties Survey Update within the 2035 55 dB DNL Noise Contour in Bedford, Concord and Lexington, 2017*

dB

Town ¹	Area Name ²	Street Address	Category
Bedford	<i>Hartwell Road</i>	<i>Beacon Street and Hartwell Road</i>	Area
	Hartwell Road	9,11,12 Beacon Street	House
	Hartwell Road	23,41,47 Hartwell Road	House
Concord	N/A	183 Virginia Road	House
	N/A	201 Virginia Road	House
Lexington	<i>Bedford Street</i>	<i>Bedford Street</i>	Area
	Bedford Street	197 thru 419 Bedford Street	House
	<i>Meagherville Extension</i>	<i>Augustus Road, Hill Street, Kimball Road, Park Street, Reed Street, Sunny Knoll Road, and Vaille Avenue</i>	Area
	Meagherville Extension	4 Augustus Road	House
	Meagherville Extension	55 Hill Street (Lexington Golf Club)	Golf Course
	Meagherville Extension	3,4,5,7,8 Kimball Road	House
	Meagherville Extension	4,6 Park Street	House
	Meagherville Extension	28,36,38,39,40,42,44,45,46,49/51,52,53,54,55,56,57,58,63,65,67,87,94, 98,104 Reed Street	House
	Meagherville Extension	1,3,5,9 Sunny Knoll Road	House
	Meagherville Extension	6,10,16,17,20,21,24,26,32,35,36,37 Vaille Avenue	House

- Notes:**
1. Lincoln did not have any properties within the reconnaissance study area.
 2. Area is a neighborhood or district of multiple streets and/or structures, and Area entries are indicated in italics.. N/A Not Applicable.

Table G-8 Fifty Year Old Properties Surveyed in Bedford, Concord and Lexington, 2012 (continued)

Town ¹	Area Name ²	Street Address	Category
Lexington	Ivan Street	12,14,22,24 Donald Street	House
	East of Bedford St	4,7,10,11,12,19,23,30,34,35,38 Eaton Road	House
	East of Bedford St	9,25,31 Fuller Road	House
	East of Bedford St	14,43,46,47,50,51,52,54,55,57,59,60,62,63,65,67,68,70,81,82,84,85,86,87,91,93,94,99,100,102 Gleason Street	House
	East of Bedford St	14,15,20,25,27,28,29,30,31,35,37,40,41,45,46,47,48,51,55,57,60,62 Harding Road	House
	Meagherville Extension	55 Hill Street (Lexington Golf Club)	Golf Course
	East of Bedford St	4,5,7,8,9 Hillside Terrace	House
	Ivan Street	10,21,25,28,29,30,32,33,36,40 Ivan Street	House
	Meagherville Extension	3,4,5,7,8 Kimball Road	House
	East of Bedford St	9 Nichols Road	House
	East of Bedford St	9,10,11,14,20,21,22,23,25,27,29,31,35,36,40,45,49,59,63,71,79,81,83,87,95,101,105 North Hancock Street	House
	Meagherville Extension	4,6 Park Street	House
	East of Bedford St	37,40 Preston Road	House
	Meagherville Extension	28,36,38,39,40,42,44,45,46,49,51,52,53,54,55,56,57,58,63,65,67,87,94,98,104 Reed Street	House
	East of Bedford St	20,31,32,36,44,53,54,70,74,75,78,82,88,91,95,100,103,104,105,107,109,127,135,138,144,152 Simonds Road	House
	Meagherville Extension	1,3,5,9 Sunny Knoll Road	House
	Meagherville Extension	6,10,16,17,20,21,24,26,32,35,36,37 Vaille Avenue	House
	East of Bedford St	20 Williams Street	House
	East of Bedford St	1 Wyman Road	House
	East of Bedford St	14,43,46,47,50,51,52,54,55,57,59,60,62,63,65,67,68,70,81,82,84,85,86,87,91,93,94,99,100,102 Gleason Street	House
	East of Bedford St	14,15,20,25,27,28,29,30,31,35,37,40,41,45,46,47,48,51,55,57,60,62 Harding Road	House
	Meagherville Extension	55 Hill Street (Lexington Golf Club)	Golf Course
	East of Bedford St	4,5,7,8,9 Hillside Terrace	House
	Ivan Street	10,21,25,28,29,30,32,33,36,40 Ivan Street	House
	Meagherville Extension	3,4,5,7,8 Kimball Road	House
	East of Bedford St	9 Nichols Road	House
	East of Bedford St	9,10,11,14,20,21,22,23,25,27,29,31,35,36,40,45,49,59,63,71,79,81,83,87,95,101,105 North Hancock Street	House
	Meagherville Extension	4,6 Park Street	House
	East of Bedford St	37,40 Preston Road	House
	Meagherville Extension	28,36,38,39,40,42,44,45,46,49,51,52,53,54,55,56,57,58,63,65,67,87,94,98,104 Reed Street	House

- Notes:**
1. Lincoln did not have any properties within the reconnaissance study area.
 2. Area is a neighborhood or district of multiple streets and/or structures. N/A – Not Applicable.
 3. The Bedford Trailer Park (East and West Sections) in Bedford has been demolished since 2005.

Table G-8 *Fifty Year Old Properties Surveyed in Bedford, Concord and Lexington, 2012*
(continued)

Town¹	Area Name²	Street Address	Category
Lexington	East of Bedford St	20,31,32,36,44,53,54,70,74,75,78,82,88,91,95,100,103,104,105,107,109 ,127,135,138,144,152 Simonds Road	House
	Meagherville Extension	1,3,5,9 Sunny Knoll Road	House
	Meagherville Extension	6,10,16,17,20,21,24,26,32,35,36,37 Vaille Avenue	House
	East of Bedford St	20 Williams Street	House
	East of Bedford St	1 Wyman Road	House

- Notes:**
1. Lincoln did not have any properties within the reconnaissance study area.
 2. Area is a neighborhood or district of multiple streets and/or structures. N/A – Not Applicable.
 3. The Bedford Trailer Park (East and West Sections) in Bedford has been demolished since 2005.

**Table G-9 Minute Man National Historical Park National Register District Data Sheet
Sorted Alphabetically by Town and Street Address**

C/NC ¹	NR CATEGORY	NPS NO.	MHC NO.	ADDRESS/LOCATION	NAME	DATES	STYLE
ALL TOWNS							
C	site	None			Battle of Lexington and Concord Battlefield	1775	n/a
C	structure	000919, 040170			Battle Road	18th through 20th centuries	n/a
NC	structure	None			Battle Road Trail	1996-2001	n/a
C	structure	Various			System of Stone Walls	18th through 20th centuries	n/a
C	site	None			System of Fields (Battle Road Unit)		n/a
CONCORD							
C ²	building	--	CON.256	448 Barrett's Mill Road	Col. James Barrett House	1705	Colonial
C	object	None		Estabrook and Liberty Street	Granite Mile Marker	early 20th century	n/a
C	object	None		Estabrook and Liberty Street	Granite Line of March Marker	early 20th century	n/a
C	object	040260		Estabrook and Liberty Street	John Buttrick Bas-Relief Monument	1915	n/a
C	structure	040255		Lexington Road	Meriam's Corner Area Stone Culvert	18th century	n/a
C	site	None		Lexington Road	(First) East Quarter School House Site	early 19th century	n/a
C	structure	040254		Lexington Road	Ox Pasture Stone Bridge	pre 1775	n/a
C	building	006549	CON.171	455 Lexington Road	Wayside (Samuel Whitney House)	1716-17; altered mid-1840s, 1860-70	Colonial/ Victorian Eclectic
C	site	None		455 Lexington Road	Wayside Site	19th century	n/a
C	site	040228, 040194, 040199, 040224		455 Lexington Road	Wayside Landscape	mid-1840s	n/a
C	building	000926		455 Lexington Road	Wayside Barn	1716-78; moved mid-1840s and 1860	No Style
C	site	012007		455 Lexington Road	Eliphelet Fox House Foundation	by 1666	n/a
C	building	006548	CON.349	663 Lexington Road	Gowing-Clark House	ca. 1836	Federal
C	site	040256		663 Lexington Road	Gowing-Clark Barn Foundation	19th century	n/a
C	building	040236	CON.352	737-739 Lexington Road	(Second) East Quarter Schoolhouse	ca. 1853-54	Frame Vernacular
C	building	4-119-B		750 Lexington Road	Palumbo Farm Enclosed Garage	ca. 1950	No Style
C	building	4-119-D		750 Lexington Road	Palumbo Farm Metal Shed	ca. 1950	No Style
C	building	4-119-C		750 Lexington Road	Palumbo Farm Open Shed	ca. 1950	No Style

**Table G-9 Minute Man National Historical Park National Register District Data Sheet
Sorted Alphabetically by Town and Street Address (continued)**

C/NC ¹	NR CATEGORY	NPS NO.	MHC NO.	ADDRESS/LOCATION	NAME	DATES	STYLE
C	building	4-119-E		750 Lexington Road	Palumbo Farm Wood Shed	ca. 1950	No Style
C	building	040028	CON.354	831 Lexington Road	Perry House	ca. 1865; ca. 1880	Greek Revival
NC	building	4-103-B		831 Lexington Road	Perry House Garage	ca. 1960	No Style
NC	building	4-103-C		831 Lexington Road	Perry Shed	ca. 1960	No Style
C	building	040231, 040232	CON.355	851 Lexington Road	Albano House, Albano Garage/Apt.	1915	Craftsman
C	building	101972		851 Lexington Road	Albano Produce Stand	1915	No Style
C	site	040246		851 Lexington Road	Albano Foundation	20th century	n/a
C	building	023167	CON.356	955 Lexington Road	Farwell Jones House	pre 1775; remodeled ca. 1870	Frame Vernacular
C	building	040241		955 Lexington Road	Farwell Jones Dairy Barn and Silo	1870	No Style
C	building	4-101-D		955 Lexington Road	Edward Nowalk Garage	early 20th century	No Style
NC	building	4-101-C		955 Lexington Road	Edward Nowalk Produce Stand	ca. 1960	No Style
C	building	4-101-E		955 Lexington Road	Edward Nowalk 6-Bay Tractor Shed	early 20th century	No Style
C	building	4-101-F		955 Lexington Road	Edward Nowalk Cottage	early 20th century	No Style
C	building	023166	CON.357	965 Lexington Road	Olive Stow House	ca. 1760	Colonial
C	building	101975		965 Lexington Road	Olive Stow House Garage	ca. 1920	No Style
C	building	101976	CON.359	1087 Lexington Road	D. Inferrara House	ca. 1927	Colonial Revival
C	building	101977	CON.360	1087 Lexington Road	D. Inferrara Farm Stand	ca. 1920s	No Style
C	building	3-118-B		1087 Lexington Road	D. Inferrara Farm Garage	ca. 1937	No Style
NC	building	3-118-D		1087 Lexington Road	D. Inferrara Farm Coop	late 20th century	No Style
NC	building	3-118-F		1087 Lexington Road	D. Inferrara Farm Field Shed	late 20th century	No Style
NC	building	3-118-E		1087 Lexington Road	D. Inferrara Farm Greenhouse	late 20th century	No Style
C	building	101978		1133 Lexington Road	Walter Beatteay House	ca. 1940-1946	Colonial Revival
NC	building	3-126-B		1133 Lexington Road	Walter Beatteay Garage	ca. 1980	No Style
C	building	006547	CON.358	1175 Lexington Road	Samuel Brooks House	ca. 1692-1728	Colonial
C	object	006545	CON.941	Liberty Street	The Minuteman	1875	n/a
C	object	040266		Liberty Street	Muster Field Monument	early 20th century	n/a
C	site	000939		Liberty Street	Ephraim and Willard Buttrick House Site	1697-1700	n/a
C	structure	040250		Liberty Street	Flint Bridge	1877	n/a
C	site	None		Liberty Street	Jonas Bateman Site	18th century	n/a

**Table G-9 Minute Man National Historical Park National Register District Data Sheet
Sorted Alphabetically by Town and Street Address (continued)**

C/NC ¹	NR CATEGORY	NPS NO.	MHC NO.	ADDRESS/LOCATION	NAME	DATES	STYLE
C	building	040024	CON.344	174 Liberty Street	Buttrick Mansion	1911	Classical Revival
C	building	040026	CON.346	174 Liberty Street	Buttrick Carriage House	1911	Colonial Revival
C	building	040025	CON.345	174 Liberty Street	Buttrick Caretaker's Cottage	1911	Colonial Revival
C	site	040183, 040182		174 Liberty Street	Buttrick Designed Landscape	early 20th century	n/a
C	site	014011		174 Liberty Street	Captain David Brown House Foundation	18th century	n/a
C	building	000932	CON.343	231 Liberty Street	Major John Buttrick House	ca. 1715; 19th-century alterations	Colonial
C	site	040249		231 Liberty Street	John Buttrick Foundation	19th century	n/a
C	building	040235		231 Liberty Street	Major John Buttrick Garage	early 20th century	Colonial Revival
NC	building	None		50 Manuel Drive	House	mid-late 20th century	Modern
NC	building	None		65 Manuel Drive	Korn House	ca. 1960	Modern Cape
NC	building	None		82 Manuel Drive	House	mid-late 20th century	Modern
NC	building	None		82 Manuel Drive	Shed	mid-late 20th century	No Style
NC	building	None		95 Manuel Drive	House	mid-late 20th century	Modern
NC	building	None		95 Manuel Drive	Garage	mid-late 20th century	No Style
C	object	006544		Monument Street	Grave and Monument to British Soldiers	1890-1910	n/a
NC	object	040262		Monument Street	DAR Marker	1975	n/a
C	object	006543	CON.939	Monument Street	1836 Battle Monument	1836	n/a
C	structure	000945	CON.940	Monument Street	North Bridge	1956	n/a
C	site	None	CON HA-13	Monument Street	Thomas Flint Site	after 1635	n/a
C	object	040261		Monument Street	Concord Fight Marker	early 20th century	n/a
NC	building	None		Monument Street	North Bridge Comfort Station	1984	No Style
C	structure	None		Monument Street	Road to North Bridge and Allée	early 20th century	n/a
C	building	000924	CON.348	242 Monument Street	Elisha Jones House	early 18th century; rebuilt 1865-66	Colonial
C	site	None		242 Monument Street	Elisha Jones Site		n/a
C	building	None	CON.347	269 Monument Street	Old Manse	1769/70	Colonial
C	site	None		North Bridge	North Bridge Landscape	1836-1956	n/a

**Table G-9 Minute Man National Historical Park National Register District Data Sheet
Sorted Alphabetically by Town and Street Address (continued)**

C/NC ¹	NR CATEGORY	NPS NO.	MHC NO.	ADDRESS/LOCATION	NAME	DATES	STYLE
C	site	None		North Bridge	Battle Road/North Bridge Site	ca. 1635-1650	n/a
C	building	000928		North Great Road	Job Brooks House	1740	Colonial
C	object	040265		Old Bedford Road	Meriam's Corner Monument	1885	n/a
C	building	040243	CON.350	34 Old Bedford Road	Meriam House	ca. 1705, ca. 1725	Colonial
C	site	None		34 Old Bedford Road	John Meriam/Joseph Meriam House Sites	ca. 1665	n/a
C	building	040234	CON.351	55 Old Bedford Road	Burke House	ca. 1904	Dutch Colonial Revival
C	building	101974		55 Old Bedford Road	Burke House Garage	ca. 1940	No Style
LEXINGTON							
C	site	040253		Marrett Street	Tabitha Nelson House (Thomas Nelson, Sr.) Site	1754-57; 1716	n/a
C	building	000929	LEX.618	21 Marrett Street	Jacob Whittemore House	prior to 1754	Georgian/ Colonial
C	building	040239		21 Marrett Street	Barn at Whittemore House	19th century; moved 1978	No Style
C	site	None		Marrett Street	Jacob Whittemore Blacksmith Shop Site	18th century	n/a
C	site	None		Mass. Avenue and Marrett Street	Barn Foundation Site	1720-1900	n/a
C	site	None	LX HA-1	Mass. Avenue at Fiske Hill	Lt. David Fiske Site	1655-1721	n/a
NC	building	1-109-A		Massachusetts Avenue	Minute Man Visitors Center	1976	Modern
C	site	040247		Old Massachusetts Ave and Wood Street	Bashian Barn Foundation	1872-75	n/a
C	site	000923		Old Massachusetts Ave and Wood Street	Ebenezer Fiske House Foundation	ca. 1729-late 19th century	n/a
C	structure	006541		Old Massachusetts Ave and Wood Street	Fiske Hill Well	1700-75	n/a
C	object	040264		Old Massachusetts Ave and Wood Street	Hayward Well Monument	1885	n/a
C	object	040259		Old Massachusetts Ave and Wood Street	Bluff Monument	1885	n/a
C	site	None			Battle Road/ Fiske Hill Site	18th century	n/a
LINCOLN							
NC	building	2-129-A		58 Bedford Lane	Mrs. Edward Downing House	ca. 1954	Modern Cape
C	site	040248		Great North Road and Old Bedford Road	Thomas Brooks Farm Foundation	1800-50	n/a
C	site	040252		Massachusetts Ave. and Virginia Road	Samuel Hartwell Farm Cellar Hole	18th century	n/a

**Table G-9 Minute Man National Historical Park National Register District Data Sheet
Sorted Alphabetically by Town and Street Address (continued)**

C/NC ¹	NR CATEGORY	NPS NO.	MHC NO.	ADDRESS/LOCATION	NAME	DATES	STYLE
C	site	040258		Massachusetts Avenue	Unidentified Cut Stone Foundation	early 19th century	n/a
NC	object	040267		Massachusetts Avenue	Paul Revere Capture Marker	pre 1902	n/a
NC	building	2-101-A		190 Massachusetts Avenue	Irene Hegenian House	1949-54	Modern Cape
NC	building	2-101-B		190 Massachusetts Avenue	Irene Hegenian Shed	ca. 1960	No Style
C	site	040027		Massachusetts Avenue	Josiah Nelson, Jr. Hop House Foundation	1810-1820	n/a
C	building	006551		200 Massachusetts Avenue	John Nelson House	1808-1810	Federal
C	building	012008		200 Massachusetts Avenue	John Nelson Barn	ca. 1810; additions 1830, 1900	No Style
C	site	None		Nelson Road	Site 22, 23	1700-1800; 1720-1800	n/a
C	site	None		Nelson Road	Daniel Brown House and Shop Site	18th century	n/a
C	site	000920		Nelson Road	Josiah Nelson House Foundation	ca. 1775	n/a
C	site	012006	LN HA-6	Nelson Road	Thomas Nelson, Jr. House Foundation	1700-1750	n/a
C	site	None		Nelson Road	Site 24	18th century	n/a
C	site	None		North Great Road	Hastings Barn Foundation	19th century	n/a
C	building	006546, 040233	LIN.64	33 North Great Road	Noah Brooks Tavern, Noah Brooks Tavern Carriage House	ca. 1798	Federal
C	building	040245		33 North Great Road	Noah Brooks Barn (Rogers Barn)	1937/38	No Style
C	site	None		North Great Road	Brooks House Site	18th century	n/a
C	building	006552	LIN.65	37 North Great Road	Joshua Brooks, Jr. House	1780	Federal
C	site	None		North Great Road	Joshua Brooks Tanyard Site	18th century	n/a
NC	building	3-111-A		59 North Great Road	Moodey House	1956	Dutch Colonial Revival
NC	building	None		71 North Great Road	Bierlich House	ca. 1957	Ranch
C	building	040244		101 North Great Road	Rego House	1890-1910	Frame Vernacular
NC	building	2-124-B		101 North Great Road	Rego House Garage	mid-late 20th century	No Style
NC	building	2-112-A		112 North Great Road	James Russell House	1954	Modern
NC	building	3-110-A		4 Old Bedford Road	W.R. Barker House	ca. 1940	Modern Cape
NC	building	3-110-B		4 Old Bedford Road	W.R. Barker Garage	1940-45	No Style

**Table G-9 Minute Man National Historical Park National Register District Data Sheet
Sorted Alphabetically by Town and Street Address (continued)**

C/NC ¹	NR CATEGORY	NPS NO.	MHC NO.	ADDRESS/LOCATION	NAME	DATES	STYLE
NC	building	3-109-A		8 Old Bedford Road	Janet Swartz House	ca. 1955	Modern Cape
NC	building	3-109-B		8 Old Bedford Road	Janet Swartz Garage	ca. 1955	No Style
C	site	None		Virginia Road	Joseph Mason House Site	18th century	n/a
C	building	000931	LIN.66	Virginia Road	Ephraim Hartwell Tavern	ca. 1733	Colonial
C	site			Virginia Road	Ephraim Hartwell Site	18th century	n/a
C	building	006553	LIN.70	Virginia Road	Captain William Smith House	ca. 1750	Colonial
C	site	None		Virginia Road	Captain William Smith Site	18th century	n/a
C	site	000930	LIN.69	Virginia Road	Sgt. Samuel Hartwell House Site	1693-1716; burned 1968;shelter 1986	n/a
C	building	040029	LIN.140	Virginia Road	McHugh Barn	ca. 1830; rebuilt 1939	No Style

- Notes:**
1. Contributing/Non-Contributing per Harrington et al. (PAL), Minute Man National Historical Park National Register of Historic Places Documentation, Concord, Lexington, and Lincoln, Massachusetts, 2001. The National Park Service is currently updating the National Register documentation.
 2. The Col. Barrett Farm Unit was added to the MMNHP in 2012, after the completion of the National Register documentation. It is assumed it would be contributing to the updated and expanded documentation.